GREATER WILLIAMS AREA

COMMUNITY WILDFIRE PROTECTION PLAN

MARCH 2005

Pumpkin Fire, May 25, 2000 Williams Ranger District. Source: Kaibab National Forest

Greater Williams Area
Community Wildfire Protection Plan

Signature Page

Submitted By: _____/s/ G. Kleindienst_____3/11/05____
George Kleindienst, Consultant Date

Recommended By: __/s/ Ken Edes_____3/17/05____
Ken Edes, Mayor Date
City of Williams

Recommended By: __/s/ Deborah Hill (for)_____4/19/05____
Liz Archuleta, Chair Date
Coconino County Board of Supervisors

Recommended By: __/s/ Mike Martinez_____3/17/05____
Mike Martinez, Fire Chief Date
Parks-Bellemont Fire District

Recommended By: __/s/ Robert Mills_____3/14/05____
Bob Mills, Fire Chief Date
Sherwood Forest Estates Fire District

Recommended By: __/s/ John F. Peterson (for)_____3/14/05____
Mike Williams, Forest Supervisor Date
Kaibab National Forest

Recommended By: __/s/ Kevin Boness_____ 6/3/05____
Kevin Boness, Flagstaff District Forester Date
Arizona State Land Department

Approved By: _____/s/ Kirk Rowdabaugh_____6/6/05____
Kirk Rowdabaugh, State Forester Date
Arizona State Land Department

Table of Contents

I. Introduction…… 5
II. Purpose and Need…… 5
III. Greater Williams Area CWPP Strategic Goals…… 10
IV. Community Base Map Development…….. 11
V. Community Risk Assessment and Analysis Process…….. 13
A. Fuel Hazards…… 13
B. Risk of Wildfire Occurrence…… 18
C. Homes, Businesses, and Essential Infrastructure at Risk…… 21
D. Other Community Values at Risk…… 21
E. Local Preparedness and Firefighting Capability…….. 24
VI. Wildland Urban Interface Identification and Cumulative Risk Rating……. 26
VII. Fuels Treatment Implementation Strategy and Priorities……. 28
A. Fuels Treatment Options…….. 30
1. Thinning…… 30
2. Hand Piling…… 33
3. Machine Piling…….. 33
4. Lop and Scatter/Crushing…….. 34
5. Chipping…… 35
6. Pile Burning…….. 35
7. Broadcast Burning……. 35
8. Various Combinations……... 36
9. Maintenance of Treatments…….. 37
B. Fuels Treatment Benefits…….. 37
C. Priority Treatment Area Identification…….. 41
D. Fuels Treatment Cost Estimates…… 43
E. Funding Sources…… 43
F. Forest Service Completed and Planned Projects…….. 44
G. Coconino County and Arizona State Land Projects……. 47
VIII. Structure Ignitability……. 48
IX. Community Education…….. 52
X. Monitoring……. 52
XI. Summary……52
XII. References and Literature Citations…….. 53
XIII. Appendices…… 53
1. Wildland Fire Advisory Council Fire Equipment List……. 54
2. Map Information Tables…… 57
3. Fuels Treatment Cost Estimates…… 60
4. Firewise Techniques and Tips…….. 61

Listing of Maps in CWPP

1. Arizona State Analysis Area Map……. 7
2. Community Base Map…….. 12
3. Dominant Overstory Vegetation Map…….. 16
4. Crown Fire Risk Map…… 17
5. 20 Year Fire Occurrence Map……19
6. Large Fire Occurrence Map…….. 20
7. Development Risk Map……. 23
8. City of Williams and Fire Districts Map (ISO Ratings)…… 25
9. Cumulative Risk Rating Map…… 27
10. Simulated Treatment Crown Fire Risk Map……. 39
11. Crown Fire Risk Map…… 40
12. Priority Area Treatment Map…… 42
13. Completed Forest Service Projects Map……45
14. Planned Forest Service Projects Map…… 46

Listing of Tables in CWPP

1. Arizona State Land and Coconino County Projects……..…… 48
2. Appendix 2, Map Information Tables……57

I. Introduction

The greater Williams area Community Wildfire Protection Plan (CWPP) is a collaborative effort between the City of Williams, Coconino County, Parks-Bellemont Fire District, Sherwood Forest Estates Fire District, Kaibab National Forest, Arizona State Land Department, and concerned citizens. Development of the CWPP was in response to the Healthy Forests Restoration Act (HFRA) of 2003. This legislation offered incentives and priority funding for communities to collaboratively develop a comprehensive wildfire protection plan. The HFRA is the legislative component of the Healthy Forests Initiative, introduced by President Bush in January 2003. Congress passed HFRA in November 2003 and the President signed it into law in December 2003.

Title I of the HFRA authorizes the Secretaries of Agriculture and Interior to expedite development and implementation of hazardous fuels reduction projects on lands managed by the USDA Forest Service and the Bureau of Land Management. The HFRA emphasizes the need for federal agencies to collaborate with communities in developing a CWPP as well as in implementing identified priority fuels treatment projects that will reduce the risk of destructive wildfires threatening those communities. Priority areas include the Wildland Urban Interface (WUI) as identified in the CWPP, municipal water supplies, and other high value areas identified through the CWPP development process.

In developing a CWPP, Title I of the HFRA requires the involvement and agreement among local governments and local fire districts; approval of a CWPP is given by the representative state entity, in this case, the Arizona State Land Department. The CWPP must also be developed in consultation with interested parties and the applicable federal agency managing the land surrounding the communities, in this case, the Kaibab National Forest.

The greater Williams area CWPP is a strategic plan developed to provide all land owners with a broad spectrum of treatment options as well as prioritize areas for treatment on federal, state, and private lands. Site specific planning and treatment is the responsibility of each land owner or jurisdictional agency and should be guided by this plan.

Guidance for developing the greater Williams area CWPP is based upon *Preparing a Community Wildfire Protection Plan: A Handbook for Wildland Urban Interface Communities (March 2004).*

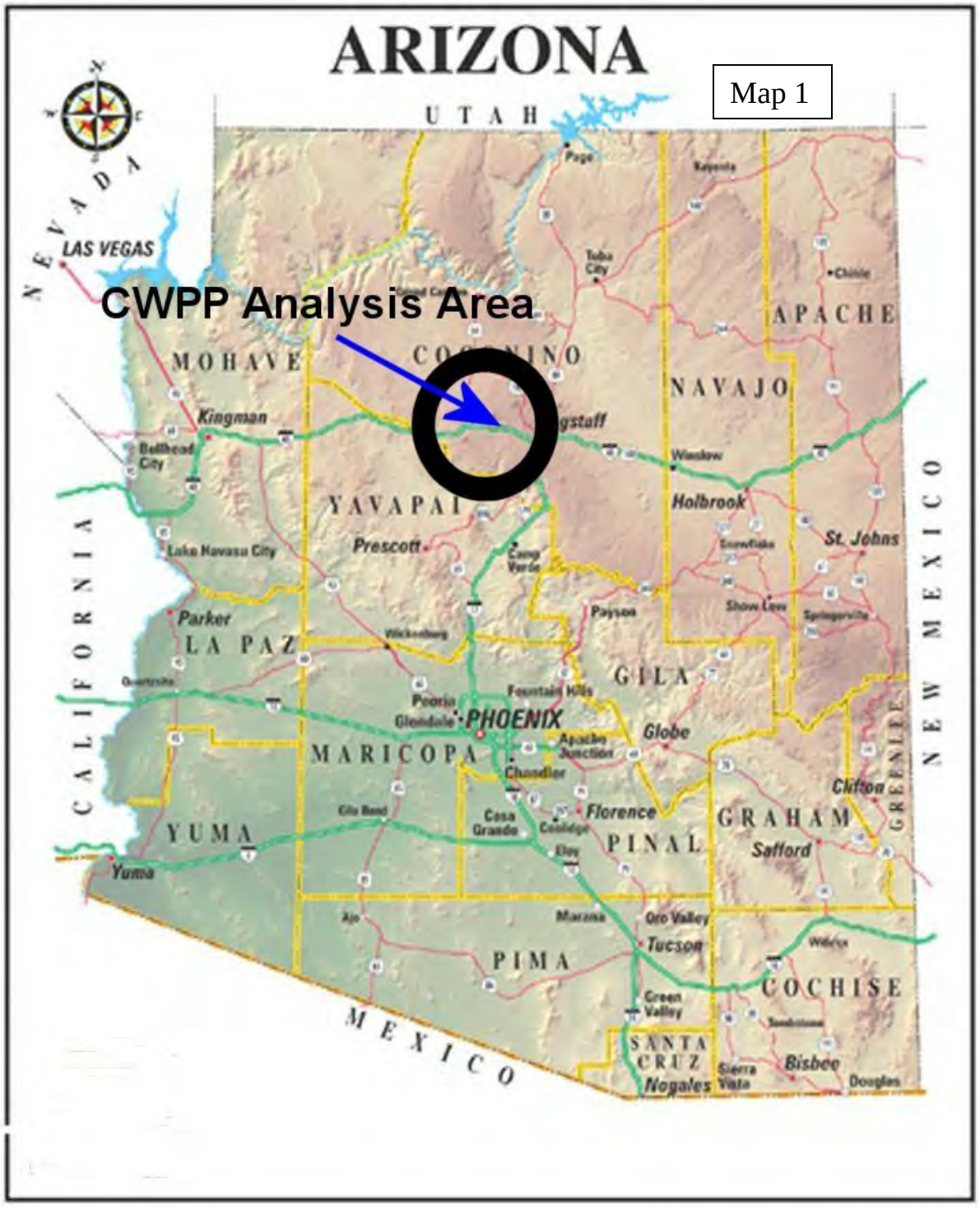
II. Purpose and Need

In September 2004 the City of Williams and Coconino County joined together to commission the development of the greater Williams area CWPP. The area of concern was the nearly 30,000 acres of private lands within or adjacent to the ponderosa pine and mixed conifer ecosystems of the Williams Ranger District, Kaibab National Forest. The majority of these private lands have some type of development ranging from a single cabin to the incorporated City of Williams. These private lands are spread throughout the area where one catastrophic wildfire could threaten and destroy several subdivisions in one daily wildfire burning period. The analysis area was

defined by the City and County as the timbered area of the Williams Ranger District to include all private inholdings potentially at risk. See Arizona State map for the planning area analyzed.

Initial attack snag falling. Source: G. Kleindienst

Burning out on Dutton fire, Grand Canyon N.P. 1988. Source: G. Kleindienst


ARIZONA
Map 1
UTAH
NEVADA
LAS VEGAS
CWPP Analysis Area
MOHAVE
COCONINO
APACHE
NAVAJO
Kingman
Bullhead City
Page
Tuba City
Winslow
Holbrook
YAVAPAI
Prescott
Lake Havasu City
Parker
LA PAZ
Payson
Show Low
St. Johns
Springerville
GILA
Peoria
Glendale
PHOENIX
Fountain Hills
Globe
MARICOPA
Apache Junction
Chandler
Florence
Casa Grande
Coolidge
PINAL
GRAHAM
Safford
Clifton
GREENLEE
CALIFORNIA
NEW MEXICO
YUMA
Yuma
Gila Bend
Ajo
Marana
Oro Valley
Tucson
PIMA
COCHISE
Green Valley
SANTA CRUZ
Nogales
Sierra Vista
Bisbee
Douglas
MEXICO

Wildfire is a natural occurrence within the southwestern ponderosa pine and Douglas fir ecosystems. Abundant research has identified the changes in these ecosystems over the past 130 years. Ponderosa pine forests of the Southwest have gone through extensive structural and compositional changes in the last century. Many references document the open, park like appearance of historic ponderosa pine stands, where herbaceous vegetation was vigorous and abundant. The dense thickets of stagnant small ponderosa pine common throughout the Southwest today are due to a combination of events in the early 1900's. Many of the thickets originated around 1919, when a rare combination of factors occurred. A good seed production year in 1918 was followed by unusually moist springs for a few years that benefited the establishment and growth of pine seedlings. Along with the good pine seed crop years, intensive livestock grazing was also a factor in the establishment of dense stands of ponderosa pine. Intensive grazing caused drastic declines in the coverage of herbaceous vegetation. This decline led to four subsequent changes: (1) fire spread was reduced because of the decrease in fine fuels, (2) ponderosa pine regeneration was increased because of reduced competition with herbaceous vegetation, (3) fire mortality to seedlings was reduced and, (4) mineral seedbeds for the establishment of seedlings was increased. Past resource demands and land management practices additionally added to our current overgrown forests, resulting in a dramatic trend towards uncharacteristic catastrophic wildfires.

Old growth & open park-like appearance with abundant grasses. Source: G. Kleindienst

Dog-hair thicket, likely from 1918 seed crop. Source: G. Kleindienst

Towering old growth or presettlement trees with abundant understory.
Source: G. Kleindienst

In the greater Williams area, the recent pine bark beetle infestation and resulting pine mortality, coupled with a ten year drought, have further increased the fuels available for combustion and substantially increased likely fire behavior and fire intensity in these overgrown ponderosa pine and Douglas fir ecosystems. The need to thin these forests, treat the slash, and reintroduce wildfire in to these ecosystems is well documented in the research records.

Bug killed ponderosa pine hillside. Source: Kaibab National Forest

The HFRA provides for community-based decision-making and empowers local governments to determine the boundaries of the WUI that surround their communities. In recognition of the cost of no action and high fire suppression costs versus the costs of hazardous fuels treatments, the City of Williams and Coconino County identified catastrophic wildfire as one of the highest costs and threats to the communities in this area and in Northern Arizona. The development of the CWPP is a direct response to their priorities and will help mitigate the potential loss of lives, homes, infrastructure, and irreplaceable natural resources.

III. Greater Williams Area Community Wildfire Protection Plan Strategic Goals

Guidance from the City of Williams, Coconino County, and the core team agencies led to development of the following strategic goals.

- Create the greater Williams area community base map, define the wildland urban interface at risk, and perform a risk analysis to identify priority areas for treatment on federal, state, and private lands.
- Offer a wide range of treatment options for use on federal, state, and private lands.
- Educate the public in firewise treatments around their homes as well as ways to reduce structural ignitability through fuels treatment, defensible space, and use of fire resistant building materials.
- Educate the public in hazardous fuels treatments needed in the wildland urban interface to not only protect lives and infrastructure, but also to protect the ecosystems that are so valuable in the Williams area.
- Improve fire prevention and suppression efforts.
- Reduce hazardous forest fuels.
- Promote community involvement in the CWPP process and fuels treatments.

- Provide options for the City and Fire Districts to reduce structure ignitability.
- Encourage development of small wood processing businesses to aid in funding the necessary fuels treatments as well as promote economic development in the area.

Greater Williams area WUI residence. Source: G. Kleindienst

IV. Community Base Map Development

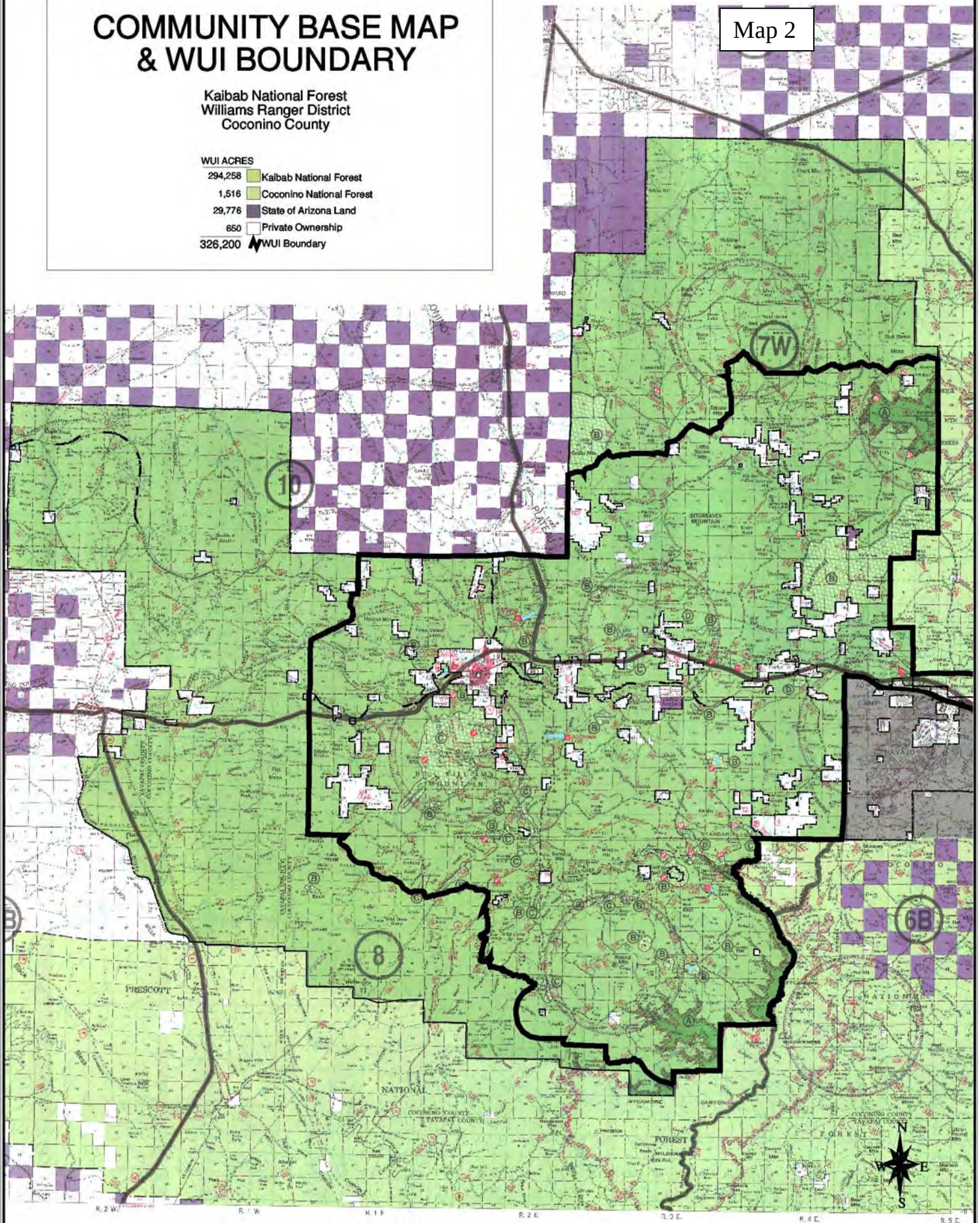
After developing the overall strategic goals of the CWPP, a community base map was needed and developed. The initial focus of the CWPP included all of the Williams Ranger District with further direction from the City and County to analyze and assess the private lands in or adjacent to the ponderosa pine and Douglas fir ecosystems. Map 2 provides a visual information baseline for core team members and the community to assess and make recommendations regarding protection and risk reduction priorities. The community base map depicts the entire District and clearly shows the scattering of private lands throughout the District.

COMMUNITY BASE MAP & WUI BOUNDARY

Map 2

Kaibab National Forest
Williams Ranger District
Coconino County

WUI ACRES	
294,258	Kaibab National Forest
1,516	Coconino National Forest
29,776	State of Arizona Land
650	Private Ownership
326,200	WUI Boundary



TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst CWPP_Boundary Layout

V. Community Risk Assessment and Analysis Process

The CWPP handbook calls for a community risk assessment to evaluate several items. These are:

- Fuel hazards.
- Risk of wildfire occurrence.
- Homes, businesses, and essential infrastructure at risk.
- Other community values at risk
- Local preparedness and firefighting capabilities.

The use of maps to display specific characteristics is essential in the analysis and risk assessment process. Maps provide a visual depiction of the analysis and planning area and display specific information needed by the core team for decision-making. Mapping is the most effective tool for evaluating the five community risk factors.

Greater Williams area CWPP meeting. Source: G. Kleindienst

The Williams Ranger District was instrumental in providing their Geographic Information Systems (GIS) mapping services and personnel. The risk factor evaluation and assessment process, and the associated map development process are described below.

A. Fuel Hazards

The dominant overstory vegetation map (Map 3) is used to depict the vegetation on the Williams Ranger district and shows the range of different types of vegetation found. Vegetation ranges from low elevation pinyon juniper grasslands near Ash Fork to the mixed conifer vegetation found on Sitgreaves, Kendrick, and Bill Williams Mountain. The map also shows the ponderosa pine zone that is the western edge of the world's largest contiguous stand of ponderosa pine that

ranges from west of Williams to the east through the White Mountains and ends in New Mexico on the Gila National Forest.

The crown fire risk assessment map (Map 4) shows areas of potential risk ranging from low to extreme. The map clearly depicts the higher risk ratings associated with the timbered areas of the District. This map was developed using the Forest Service INFORMS computer program.

INFORMS is a decision support framework designed specifically for the Forest Service. The acronym comes from "Integrated Forest Resource Management System." INFORMS was engineered to support planning efforts associated with both watershed and project level planning and is ideal for the CWPP planning process. INFORMS utilizes several existing Forest Service software programs including Forest Vegetation Simulator (FVS), Most Similar Neighbor (MSN) analysis, and the Fuels and Fire Extension (FFE) to the FVS program. INFORMS uses actual forest stand examination data within the FVS program and can populate uninventoried areas with data through the MSN program. Confidence levels are evaluated on all areas with unknown stand exam data and the Forest field checks those areas that lack a high confidence rating.

Using the Forest Service INFORMS program to evaluate the fuel hazard risks provides a widely accepted and tested method to determine relative risk. INFORMS can also test the effectiveness of various fuels treatments over time. It can be used on a large scale and is defined in this CWPP analysis as a coarse filter or landscape level analysis.

The Fire and Fuels Extension of FVS provides a burn model that determines a torching index and a crowning index. The torching index depends on surface fuels, surface fuel moisture, canopy base height, slope steepness, and wind reduction by canopy. The torching index simply expresses the likelihood of a surface fire reaching intensities where the fire burns the crowns of individual or small clumps of trees. The crowning index depends on canopy bulk density, slope steepness, and surface fuel moisture. As a stand becomes denser, active crowning occurs at lower wind speeds, and the stand is more vulnerable to crown fire. The crowning index is simply the likelihood that once a wildfire begins torching, whether the fire will continue to spread through the adjacent crowns.

Torching trees. Source: G. Kleindienst

These indices link directly to terminology used in defining wildfire spread. "Surface" fires burn only those fuels on the ground with little effect on tree crowns. "Passive crown fires" have sporadic torching or short-lived crown fire runs, but continues to drop back to the ground as a surface fire. "Active crown fires" consume the majority of the fuels, both surface and crown, and are highly destructive.

An alternative risk assessment process that was used in the Forest Ecosystem Restoration Analysis project (Forest ERA) that was conducted by Northern Arizona University was considered as an alternative to INFORMS. The CWPP core team felt that the planning area was small enough encompassing only one federal jurisdiction, and that using the Forest INFORMS program offered a better analysis and risk assessment. Even though INFORMS in this CWPP analysis is considered "coarse filter", it does rely on specific stand exam data in the FVS program and therefore provides a more comprehensive analysis and risk assessment process.

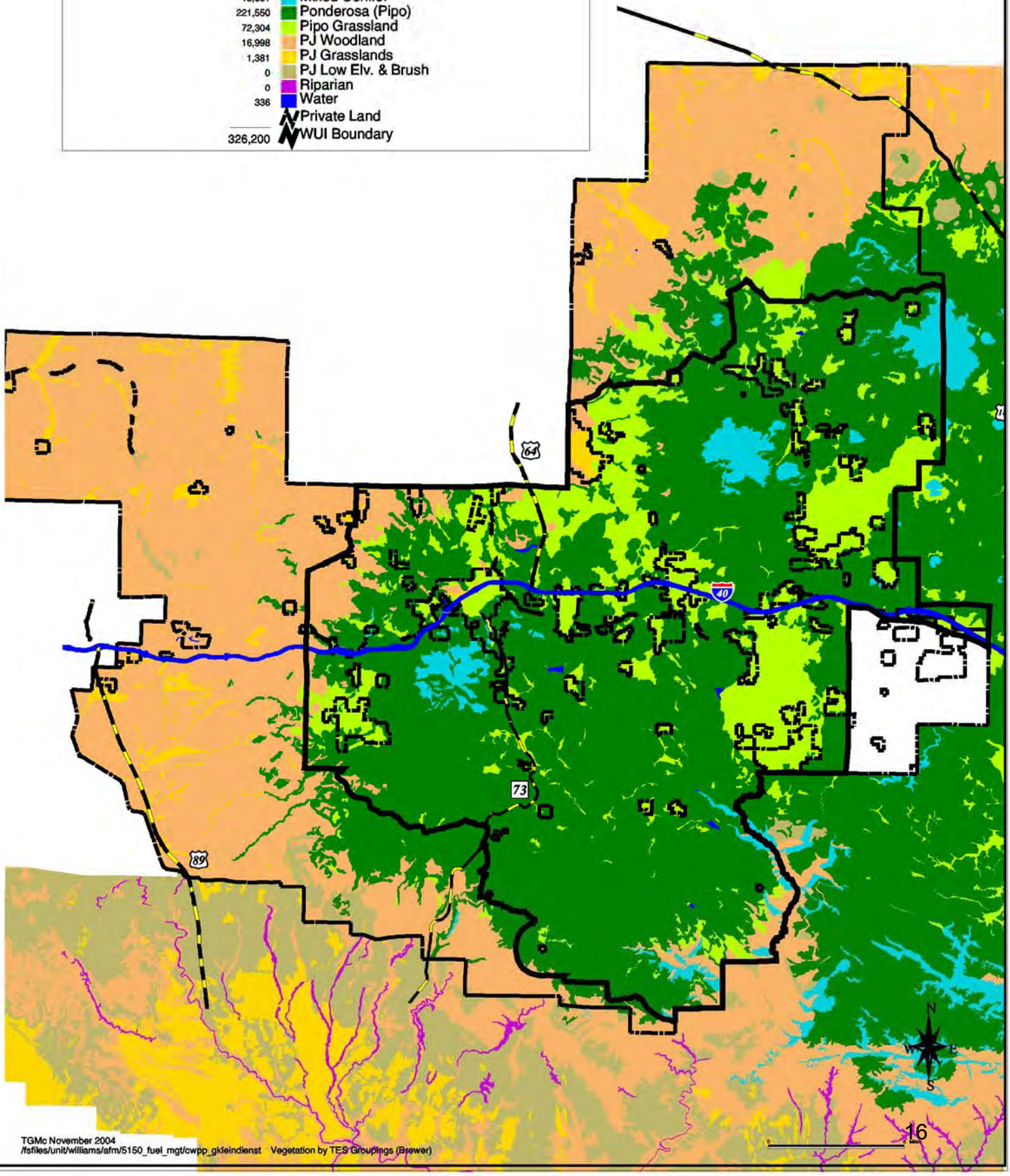
The Forest ERA Project used a more involved process with more stakeholders and a wider range of values on more of a macro scale than the CWPP process. It is interesting to note, however, that the Forest ERA Project had a similar outcome in the area of priority setting. (See Figure 23, page 26, Volume 2 - Western Mogollon Plateau Adaptive Landscape Assessment Report, Forest Ecosystem Restoration Analysis – Project Report, 2002-2004). For a copy of this report contact Northern Arizona University's Forest ERA department.

DOMINANT OVERSTORY VEGETATION & WUI BOUNDARY

Kaibab National Forest
Williams Ranger District
Coconino County

Map 3

WUI ACRES	
13,631	Mixed Conifer
221,550	Ponderosa (Pipo)
72,304	Pipo Grassland
16,998	PJ Woodland
1,381	PJ Grasslands
0	PJ Low Elv. & Brush
0	Riparian
336	Water
	Private Land
326,200	WUI Boundary



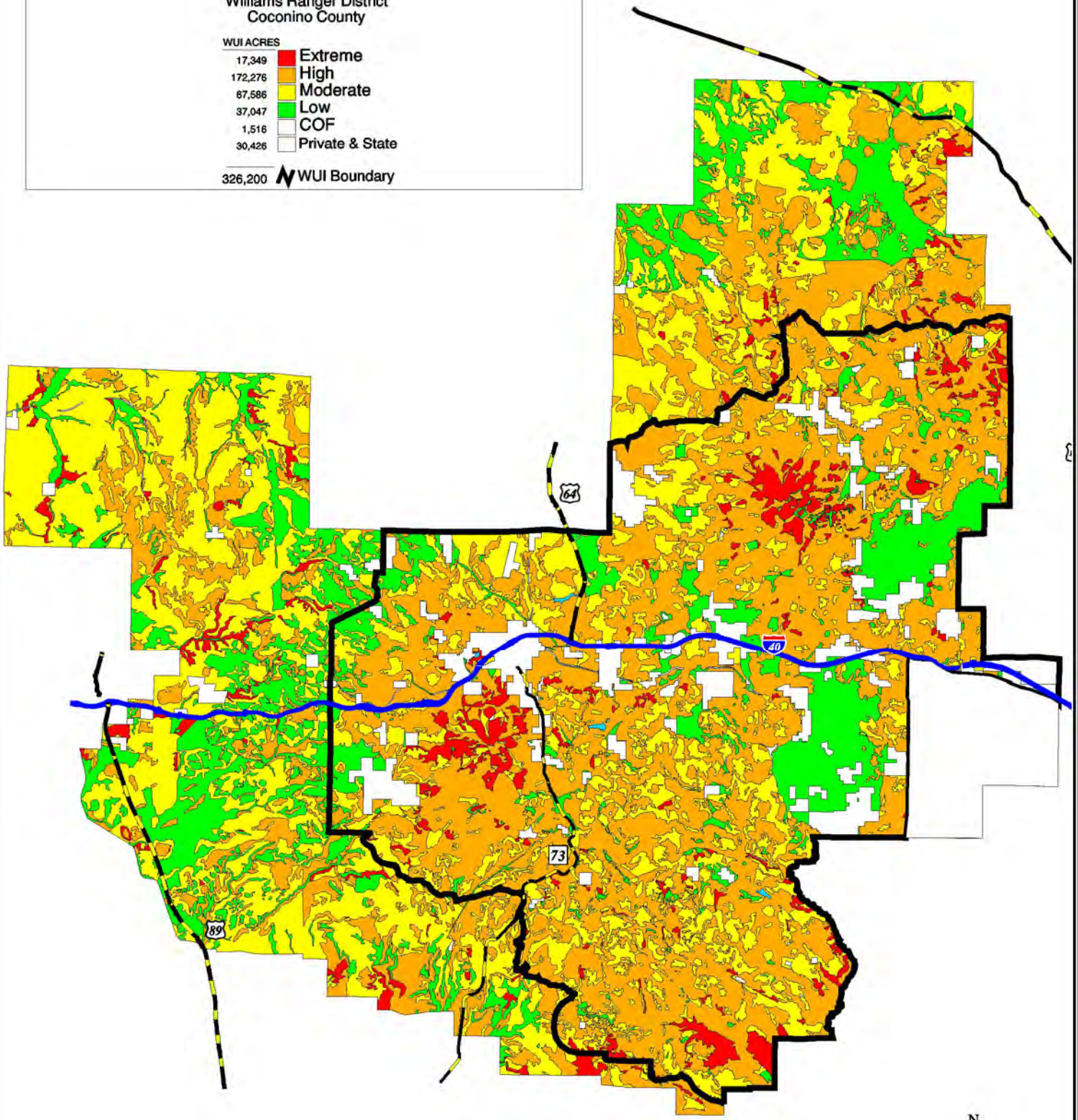
TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst Vegetation by TES Groupings (Brewer)

CROWN FIRE RISK ASSESSMENT & WUI BOUNDARY

Kaibab National Forest
Williams Ranger District
Coconino County

Map 4

WUI ACRES	
17,349	Extreme
172,276	High
67,586	Moderate
37,047	Low
1,516	COF
30,426	Private & State
326,200	WUI Boundary



N
W E
S

TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst Crown Fire Risk

B. Risk of Wildfire Occurrence

The 20 year fire occurrence map (Map 5) and the large fire occurrence map (Map 6) clearly show that the majority of the wildfire starts and the large fire occurrence have historically happened in the timbered areas of the Williams Ranger District. The 20 year average for the District is 95 fires burning 902 acres annually.

Mathes fire, Grand Canyon National Park, 1995. Source: G. Kleindienst

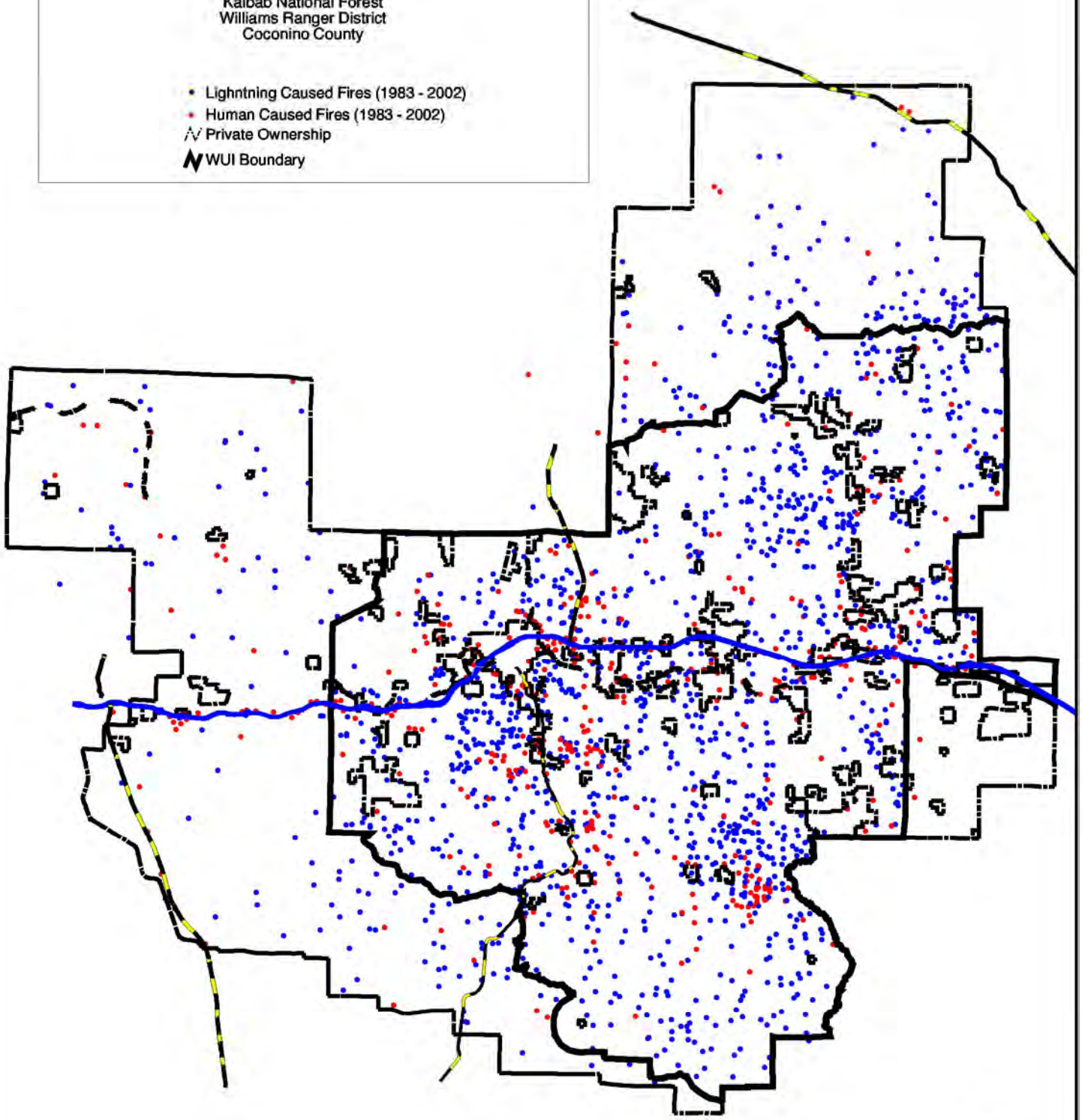
Burned home, Florida fires, 1998. Source: G. Kleindienst

20 YEAR FIRE OCCURENCE & WUI BOUNDARY

Map 5

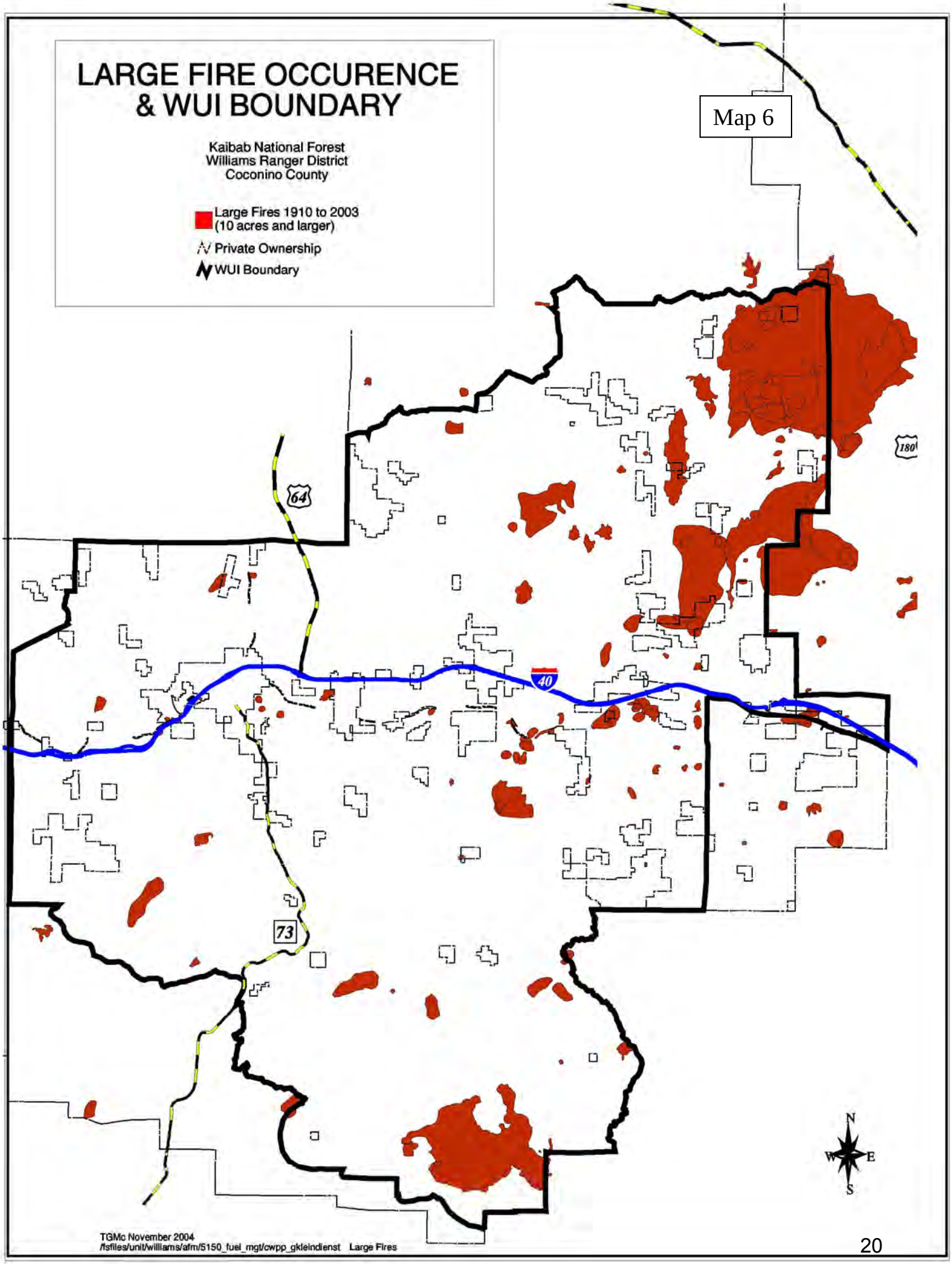
Kaibab National Forest
Williams Ranger District
Coconino County

- Lighntning Caused Fires (1983 - 2002)
- Human Caused Fires (1983 - 2002)
- Private Ownership
- WUI Boundary



N
W E
S

TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst All Fires 1983-2002


LARGE FIRE OCCURENCE
& WUI BOUNDARY
Kaibab National Forest
Williams Ranger District
Coconino County
Large Fires 1910 to 2003
(10 acres and larger)
Private Ownership
WUI Boundary
Map 6
64
40
73
180
N
W
E
S
TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst Large Fires

C. Homes, Businesses, and Essential Infrastructure at Risk

The development risk assessment map (Map 7) was developed by visiting nearly all of the private lands in or adjacent to the ponderosa pine and Douglas fir timbered portions of the District. The development risk map was developed to show which parcels of private land had some form of development and are shown on the map in red. Undeveloped private land is shown in yellow. Development of these private lands ranges from a single cabin to the incorporated City of Williams. Many of these private parcels have multiple homes and subdivisions with several parcels containing homes worth several hundred thousands of dollars.

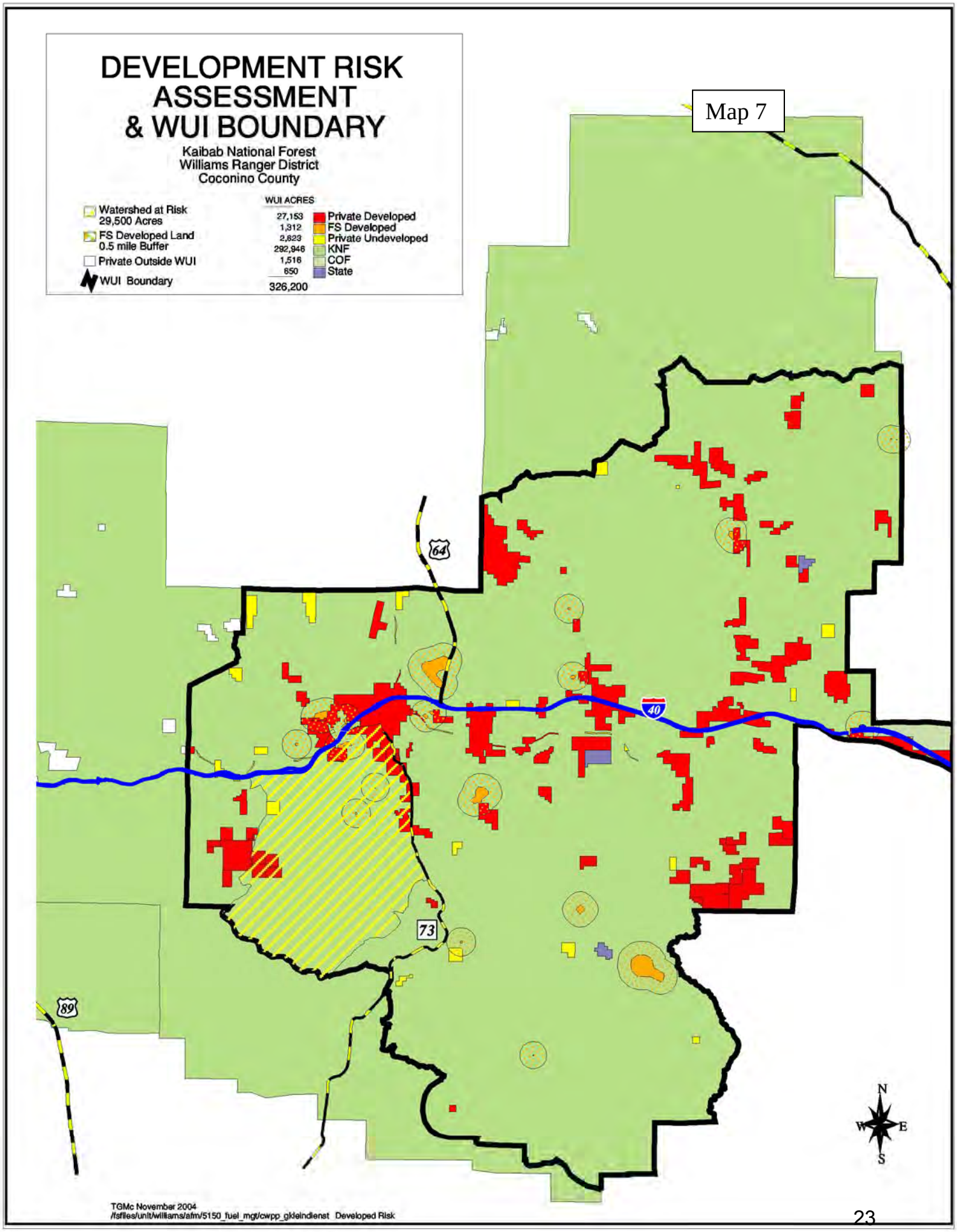
The Forest Service also has many developed lands within the timbered zone including; developed campgrounds, ski lodge, electronics sites, lookout towers, and administrative sites. These areas are shown on map 7 in orange with a ½ mile buffer around the sites to better identify them on the map.

D. Other Community Values at Risk

Bill Williams Mountain was identified by both the City of Williams and the USDA Forest Service as a critical resource deserving special protection from catastrophic wildfire. Bill Williams Mountain lies just south of Williams and has an elevation of 9,256 feet. There is a multi-million dollar electronics site on the top of the mountain providing communications towers for the Department of Public Safety, USDA Forest Service, Arizona State Land Department, Burlington Northern Santa Fe railroad and several other governmental and private enterprises. The north side of the mountain is home to a small ski resort, and homes and other infrastructure surround three sides of the base of the mountain. Most importantly, Bill Williams Mountain is the apex of three critical watersheds; the Sycamore and Hell Canyon watersheds to the south and east, the Cataract Creek and Spring Valley Wash watersheds to the north, and the Ash Fork Draw and Upper Partridge Creek watersheds to the west. The City of Williams still relies heavily on surface run-off and several reservoirs for their domestic drinking water. A stand replacing wildfire on Bill Williams Mountain could result in a loss of critical emergency communications systems, silting in of reservoirs, loss of water storage, loss of recreational areas and opportunities, and the potential loss of lives, homes, and critical infrastructure.

Bill Williams Mountain. Source: G. Kleindienst

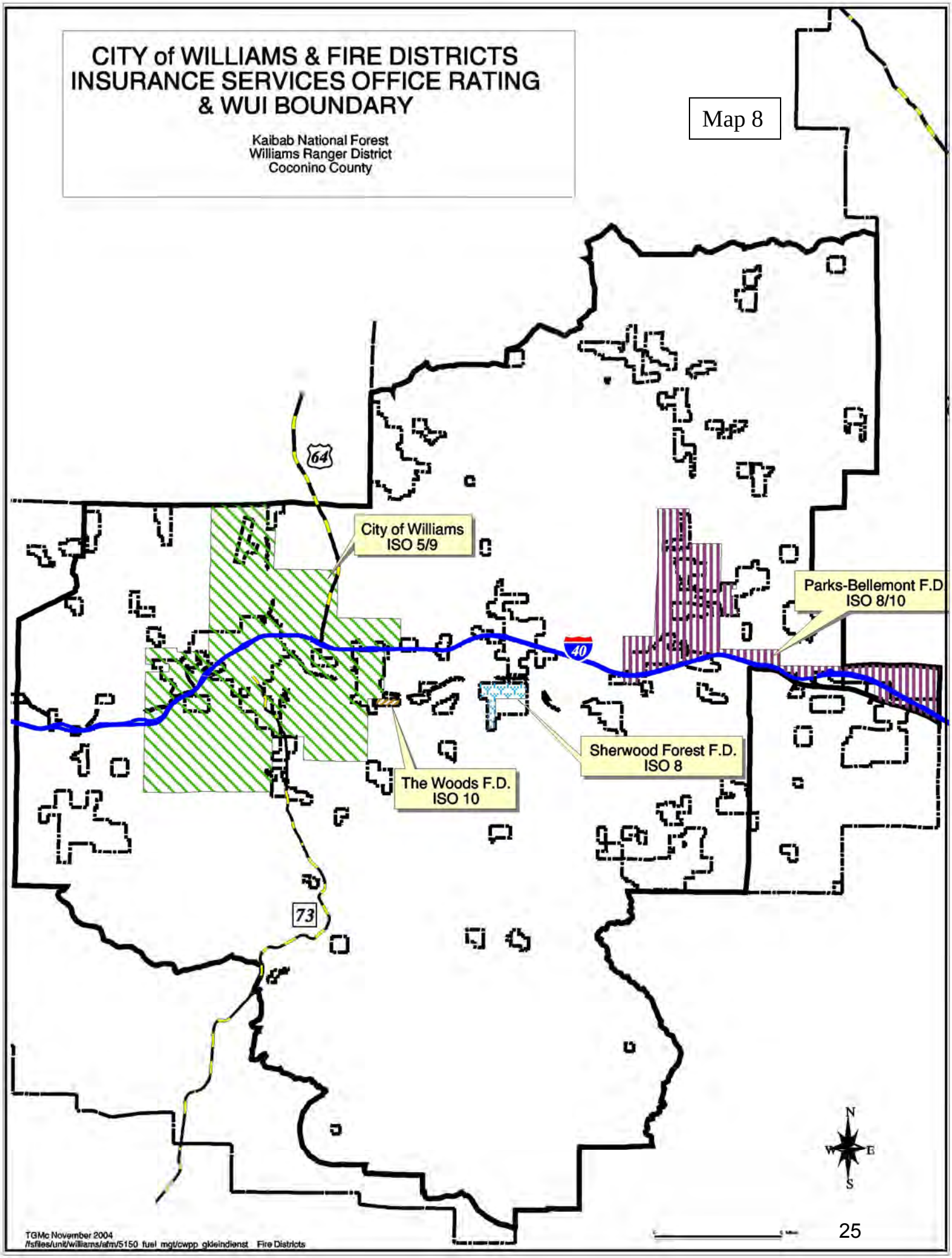
The Healthy Forest Restoration Act requires that other values needing special protection be evaluated using fire regime and condition class. The USDA Forest Service has determined that the timbered area of the Williams Ranger District is a historical fire regime I. Fire regime I is defined as an area in which historically there have been low severity fires with a frequency of 0 through 35 years that is located primarily in lower elevations of pine, oak, and pinyon juniper forests. The forest has also determined that Bill Williams Mountain is in either a condition class 2 or 3. Condition class 2 and 3 are defined as a vegetation composition, structure, and fuels that have a moderate or high departure from the natural fire regime and predispose the system to risk of loss of key ecosystem components. Wildfires are moderately or highly uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are substantially outside the natural range of variability. The forests fire regime and condition class determination for Bill Williams Mountain allows for special protection measures and meets the requirements as set forth in HFRA. Map 7 depicts the Bill Williams Mountain protection area in crosshatched yellow.


DEVELOPMENT RISK ASSESSMENT & WUI BOUNDARY
Kaibab National Forest
Williams Ranger District
Coconino County
Watershed at Risk 29,500 Acres
FS Developed Land 0.5 mile Buffer
Private Outside WUI
WUI Boundary
WUI ACRES
27,153 Private Developed
1,312 FS Developed
2,823 Private Undeveloped
292,946 KNF
1,516 COF
650 State
326,200
Map 7
64
40
73
89
N
W
E
S
TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst Developed Risk

E. Local Preparedness and Firefighting Capability

The Wildland Fire Advisory Council (WFAC) is a group of firefighting agencies in the greater Williams area. Members include the Kaibab National Forest, Arizona State Land Department, fire departments from the City of Williams, Ashfork, Paulden, Valle-Wood, Tusayan, Junipine, Parks Bellemont, Sherwood Forest Estates, Red Lake South, and Kaibab Estates West. The purpose of the advisory council is for firefighting and emergency response agencies in the area to meet and work together on various issues common to all. These issues may include, but are not limited to; fire prevention, communications, fire training, mutual aid, evacuations, prescribed burning, smoke management, structure protection, and wildfire suppression. All agencies in WFAC provide mutual aid for emergency responses. Appendix 1 is a listing of all structural and wildfire equipment listed by agency. The City of Williams and Fire District map (Map 8) identifies the fire departments within the timbered zone along with their Insurance Services Office (ISO) rating.

Parks-Bellemont Fire Station, pile burning. Source: Kaibab National Forest


CITY of WILLIAMS & FIRE DISTRICTS
INSURANCE SERVICES OFFICE RATING
& WUI BOUNDARY
Kaibab National Forest
Williams Ranger District
Coconino County
Map 8
64
City of Williams
ISO 5/9
Parks-Bellemont F.D
ISO 8/10
40
Sherwood Forest F.D.
ISO 8
The Woods F.D.
ISO 10
73
N
W
E
S
TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst_Fire Districts

VI. Wildland Urban Interface Area Identification and Cumulative Risk Rating

The preceding maps and the relative risks displayed were used to determine the greater Williams area wildland urban interface boundary. This 326,200 acre area is predominantly in the ponderosa pine and mixed conifer ecosystems and surrounds most of the widely scattered developed private lands. This large area was determined by the CWPP core team to better define the area at risk rather than using a simple buffer system to describe the wildland urban interface. The core team determined that an area as much as six miles to the south and west of developments was needed as history has shown that large catastrophic wildfires can easily spread this distance in one afternoon burning period. Evidence from the Rodeo-Chediski fire in eastern Arizona proved this on several occasions and the Bridger-Knoll fire on the North Kaibab Ranger District traveled over nine miles on the day it started.

Map 9 displays the cumulative risk rating within the WUI and was determined by combining the crown fire risk and the development risk maps into a cumulative risk-rating map. The intent of the map is to visually display the size and scope of the crown fire risk associated with developed private lands in the wildland urban interface. However, the red colored private lands on the cumulative risk map only depict private lands that have some level of development or infrastructure at risk and these private lands should not necessarily be interpreted at extreme risk for crown fire.

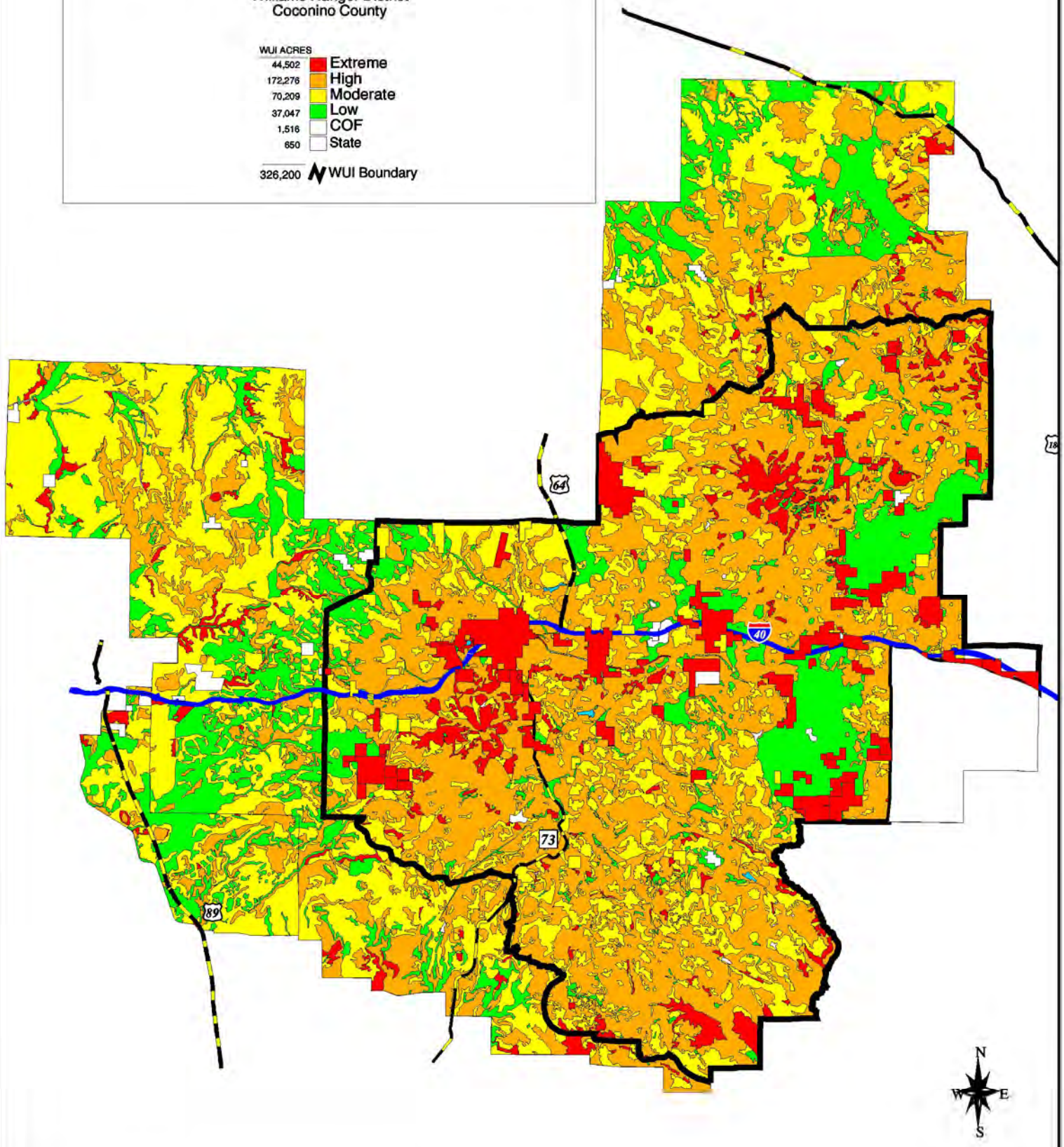
Tables of specific map information can be found in Appendix 2.

CUMULATIVE RISK ASSESSMENT & WUI BOUNDARY

CROWN FIRE RISK & DEVELOPMENT RISK COMBINED

Kaibab National Forest
Williams Ranger District
Coconino County

Map 9



TGMc November 2004
/tiffiles/unit/williams/afm/5150_fuel_mgt/cwpp_gk/windlerust - Cumulative Fire Risk Assessment

VII. Fuels Treatment Implementation Strategy and Priorities

Fuels, weather, and topography determine fire behavior and especially fire intensity. Of these three, we are able to affect only the fuels element in modifying fire behavior and intensity. The implementation and mitigation portion of the CWPP will focus on fuel treatments that reduce stand densities and accumulated debris on the forest floor.

Crown fires are often considered the primary threat to the ecology of dry forest types and human values. However, even surface fires can damage soils, weaken or kill overstory trees, and provide an ignition source for homes and other property. Our current understanding of fire behavior in dry forests dominated by ponderosa pine and Douglas fir indicates that a crown fire begins with a transition from a surface fire to the ignition of the canopy. Crown fires are therefore dependent upon the sequence of available fuels (first surface fuels-woody fuel, low vegetation and shrub strata, then ladder fuels, then canopy fuels). Fuel management in forest stands can be designed to target specific fuel strata and disrupt the vertical progression of fire from surface fuels to ladder fuels to canopy fuels, and the horizontal progression of fire through individual strata, especially from crown to crown. Research has shown that the most effective strategy for reducing crown fire occurrence and severity is to (1) reduce surface fuels, (2) increase height to live crown, (3) reduce ladder fuels and canopy bulk density, and (4) reduce continuity of the forest canopy. The overall objective of the Greater Williams Area CWPP treatments is to reduce the likelihood of crown fire and other fire behavior that would lead to a loss in value, lead to undesirable future conditions, or threaten lives and destroy homes.

The specific goals of the greater Williams area CWPP implementation plan are:

- Fuel treatments will provide for both firefighter and public safety during wildfire suppression emergencies.
- Fuel treatments will greatly reduce the potential of a high intensity crown fire from entering communities and destroying property.
- Fuel treatments will provide areas where fire suppression efforts can be effective and destructive wildfires are contained at a minimal size.
- Fuel treatments will provide areas where conditions exist that allow for prescribed fire and wildland fire use with little threat to communities.
- Fuel treatments will be based upon the best available science and multi-party monitoring that leads to adaptive management and flexibility in future fuels treatment planning and implementation.
- Fuel treatments will contribute toward restoration of healthy sustainable ecosystems that are resistant to natural disturbances such as drought, insects and wildfire.
- Fuel treatments will begin returning the entire WUI area back to a fire regime condition class 1, where fire can play a natural role in maintaining healthy, sustainable, and resilient ecosystems.

Implementation strategies are outlined here as treatment options available for all agencies and jurisdictional ownerships. These implementation strategies and treatment options are based on the USDA Forest Service General Technical Report *Science Basis for Changing Forest Structure*

to Modify Wildfire Behavior and Severity, RMRS-GTR-120, Dr. Russell T. Graham, et al (April 2004). The following is the abstract from this report.

> *Fire, other disturbances, physical setting, weather, and climate shape the structure and function of forests throughout the Western United States. More than 80 years of fire research have shown that physical setting, fuels, and weather combine to determine wildfire intensity and severity. Millions of acres of forestlands (mainly in dry forests dominated by ponderosa pine and/or Douglas fir) contain a high accumulation of flammable fuels compared to conditions prior to the 20th century. Forests with high stem density and fuel loading combined with extreme fire weather conditions have led to severe and large wildfires (such as those seen in the summers of 2000, 2002, and 2003) that have put a number of important values at risk. Although homes in the path of a wildfire are perhaps the most immediately recognized value, these wildfires also put numerous other human and ecological values at risk, such as power grids, drinking water supplies, firefighter safety, critical habitat, soil productivity, and air quality.*
>
> *For a given set of weather conditions, fire behavior is strongly influenced by stand and fuel structure. Crown fires in the dry forest types represent an increasing challenge for fire management as well as a general threat to the ecology of these forests and the closely associated human values. Crown fires are dependent on the sequence of available fuels starting from the ground surface to the canopy. Limiting crown fire in these forests can be accomplished by actions that manage in concert the surface, ladder, and crown fuels. Reducing crown fire and wildfire growth across landscapes decreases the chances of developing large wildfires that affect human values adjacent to forested areas.*
>
> *Fuel treatments can help produce forest structures and fuel characteristics that then reduce the likelihood that wildfires will cause large, rapid changes in biophysical conditions. Fuel treatments can also help modify fire behavior sufficiently so that some wildfires can be suppressed more easily. Subsequent sustained fuel treatments can maintain these conditions. Different fuel reduction methods target different components of the fuel bed. Thinning mainly affects standing vegetation, and other types of fuel treatments such as prescribed fire and pile burning woody fuels are needed to modify the combustion environment of surface fuels. In forests that have not experienced fire for many decades, multiple fuel treatments – that is, thinning and surface fuel reduction – may be required to significantly affect crown fire and surface fire hazard. Fuel treatments cannot guarantee benign fire behavior but can reduce the probability that extreme fire behavior will occur. Fuel treatments can be designed to restore forest conditions to a more resilient and resistant condition than now exists in many forests and subsequent management could maintain these conditions, particularly in dry forests (ponderosa pine and Douglas fir) where crown fires were historically infrequent. The degree of risk reduction will depend to some degree on the level of investment, social and economic acceptability of treatments, and concurrent consideration of other resource values.*

The report describes the available scientific knowledge for making informed decisions on fuel treatments used to modify wildfire behavior and effects in dry forests of the interior Western United States (especially forests dominated by ponderosa pine and Douglas fir). As stated above, this report is perfectly suited for describing treatment options within the greater Williams area WUI and is the basis for all CWPP fuels treatment options.

A. Fuels Treatment Options

In forests that have not experienced fire for many decades, multiple fuel treatments are often required to achieve the desired fuel conditions. Thinning followed by prescribed fire reduces canopy, ladder, and surface fuels, thereby providing maximum protection from severe fires in the future. Potential fire intensity and severity in thinned stands are significantly reduced only if thinnings are accompanied by a reduction in the surface fuels created from the thinning operation. The following describes each treatment option individually, recognizing that most areas will require a combination of two or more treatments as well as periodic maintenance to accomplish the overriding goal of reducing the likelihood of crown fires within the WUI.

1. Thinning

Thinning is the silvicultural practice of removing selected trees in a stand to reduce competition for light, water, and nutrients and thereby promote the growth and survival of the remaining trees. Thinnings can range from full ecological restoration treatments leaving only 25-40 large diameter trees to less intensive treatments as described below.

Full restoration thinnings are used to restore forest structure to the approximate condition at the time of disruption of the natural fire regime. This entails recreating, as much as possible, the density, spatial distribution, and natural variability of living trees of all species that were present prior to fire exclusion beginning in approximately 1870. The goal of full restoration treatments would be reached through thinning and prescribed burning. The objective of full restoration treatment is to remove most of the post settlement trees, allowing for replacement trees for presettlement tree mortality, and produce an uneven aged stand where trees are grouped in clumps and are vibrant, healthy, resilient, and resistant to natural disturbances such as drought, bug infestation, and wildfires. Full restoration thinning is considered the most aggressive thinning treatment in use today.

Intermediate thinnings are generally called “thinnings from below” and typically remove the small and intermediate sized trees to provide openings and reduce ladder fuels. Presettlement trees are protected as well as some of the larger post settlement trees. Thinnings are used to create openings, leaving uneven aged stands in clumps in a mosaic fashion.

Low intensity thinnings are those that generally only remove the smaller diameter trees (less than 9” in diameter) but could include sizes up to 16 inches to meet crown fire risk reduction goals.

Planning for site specific projects should include options that incorporate restoration principles. Planning should also address the timing and methods of thinning operations to minimize the risk of insect and disease infestations.

Any of the thinning treatments can offer some commercial value of the trees that are cut. The sale of wood products from our overgrown forests is encouraged to help off-set the costs of treatments.

Cost estimates for thinning assume that only trees up to 16 inches in diameter would be cut by the agencies or private landowners. Trees larger than 16 inches are assumed to have commercial value therefore would not cost the agencies or landowners for removal and the value of the timber could offset other fuels treatment work.

The desired future condition of any of the thinning treatments is to create forest conditions, across the landscape, where the likelihood of a catastrophic crown fire will not occur and threaten lives and property. In general, forest stands will consist of 25 to 100 larger diameter trees per acre or a basal area ranging between 30 and 80 per acre. Trees of all sizes are found in clumps with openings interspersed with abundant herbaceous vegetation.

Basal area is defined as the cross section area of tree stems in square feet commonly measured at breast height (4.5' above ground). The basal area factor is the number of square feet of basal area of all trees on a given acre of land. Forty basal area equals 40 square feet of cross sectioned tree stems on one acre.

Thinning dog hair thicket. Source: Kaibab National Forest

Thinned to 30 basal area, slash not yet treated. Source: Kaibab National Forest

Recent thinned, piled, and burned treatment area. Source: G. Kleindienst

Thinning a forest stand without the removal or treatment of the slash, often creates a greater fire hazard than prior to the thinning. The following describes the various treatments for dealing with thinning slash.

2. Hand Piling

Hand piling is simply the manual piling of slash to be burned under moist or wet conditions. Hand piles are generally small compared to mechanical piles and are usually only six feet high and 6-8 feet in diameter. Hand piles are located in openings to minimize scorching and mortality of nearby trees when burned. Hand piling is labor intensive and therefore costly but is a necessary tool when other factors prevent a different slash treatment (such as slope steepness).

Hand piles in thinned area. Source: G. Kleindienst

3. Machine Piling

Machine piling is widely used and is done with bulldozers and skidders to pile slash for later burning. Machine piling is appropriate on flatter terrain, stable soils, and in more open areas where other factors, such as cultural resource concerns, are not an issue. Machine piles are generally larger than hand piles and can be 12 feet high and cover large areas. The size of the piles is determined by the size of the openings to minimize scorch and mortality.

Both methods of piling, hand and machine, are extensively used in treatment areas with high fuel loads to more safely treat the large volume of slash. Piling is also the most common slash treatment adjacent to homes and private property.

Dozer piling. Source: Kaibab National Forest

4. Lop and Scatter/Crushing

Lop and scatter slash treatment is utilized in those areas where the fuel load is less and therefore safe to lop and scatter the slash for later treatment in a prescribed broadcast burn. This method generally calls for thinned trees to be limbed and cut to lay within 12-24 inches off the ground and dispersed to prevent fuel concentrations.

Mechanically crushing slash has the same objective where bulldozers are used to crush the slash down to the ground. Crushing is less labor intensive and can be used where other natural resource issues are not a concern for mechanized equipment.

Un-lopped thinning slash. Source: Kaibab National Forest

5. Chipping

Although occasionally used, this technique is comparatively expensive and chips decompose slowly in our area. If later broadcast burning is anticipated, chips may add to smoke management concerns. Chipping can be used effectively around private land where the homeowner uses the chips for mulch or landscaping. Hauling chips from a site is very expensive.

6. Pile burning

Pile burning is done under moist or wet conditions. The goal of pile burning is to consume 80-100% of the piled material while minimizing the scorch and mortality of the residual stand. Ignition is generally accomplished by hand using drip torches. Pile burning may be the final treatment or it may serve to remove excess slash in preparation for a later broadcast burn.

Pile burning in snow. Source: Kaibab National Forest

7. Broadcast Burning

Broadcast burning is defined as the skillful application of fire on a landscape to intentionally burn forest fuels. Burning is conducted under prescribed conditions specified in an approved plan to meet management objectives and confined to a predetermined area. Broadcast burning generally calls for flame lengths of less than 4 feet but some prescriptions may call for greater flame lengths to raise crown heights or thin with fire. Ignition can be by hand with drip torches, by mechanized means using all terrain vehicles, or aerially, using helicopters and a plastic sphere dispensing machine.

Ignition of broadcast burn unit. Source: Kaibab National Forest

Patrolling lines of broadcast burn. Source: Kaibab National Forest

8. Various Combinations

Multiple treatments in a given area are often needed to effectively treat an area and minimize crown fire potential. This is even truer the closer the treatment area is to homes, buildings, or infrastructure needing protection. Full restoration thinning, followed by slash piling and burning, with a final broadcast burn of the site offers the greatest protection and highest likelihood that a crown fire will not threaten structures. The objective of fuels treatments within the WUI is to treat the entire fuel strata. Thinning reduces stand density, ladder fuels, crown bulk density, and reduces the continuity of the forest canopy. Pile burning and broadcast burning reduces the surface

fuel load and can increase the height to live crown. Generally a combination of treatments is required to meet the fuels treatment objectives.

9. Maintenance of Treatments

Maintenance of treated areas is often overlooked, as initial entry fuels treatments are the priority. Within the RMRS-GTR-120 report, research is cited that examined the effectiveness of treatments over time. In general, in the dry forest types of the greater Williams area, treatment effectiveness lasts only 7-15 years. Depending upon the initial treatment, maintenance usually only requires a second entry broadcast burn which is typically less complex than the first entry burn. However, if the initial treatment was low intensity or included no thinning, additional thinning may be required. Maintenance of existing treated areas within the WUI is recommended every 10 years.

Low intensity burn in open stand. Source: Kaibab National Forest

B. Fuels Treatment Benefits

The following two maps (Maps 10 and 11) are used to display the tremendous benefits of fuels treatments. The first map is a crown fire risk assessment using the same methodology as before. However, through the Forest Vegetation Simulator, we have applied a thinning treatment down to 40 basal area. The slash was piled and then burned. The INFORMS burn model then re-determined the torching and crowning index across the area. The original crown fire risk map is included again for easy comparison of the results.

One anomaly occurred during this process in the pinyon-juniper woodlands. Thinning the PJ this much in the simulation resulted in a fuel type conversion where grasses and shrubs dominate the

area. This changed many areas from a moderate risk to an extreme risk where the burn model predicts the shrubs being completely consumed and therefore at "extreme" risk.

Currently, nearly 60% of the identified wildland urban interface is in the extreme or high risk category for potential crown fire. After thinning, piling, and burning, the areas with extreme or high risk for crown fire are reduced to 11**%** of the WUI area. A large portion of this 11% is in the pinyon-juniper areas due to the fuel type conversion in the simulation so a more accurate estimation of change in the timbered area is less than 5% at high or extreme risk. The map information table in Appendix 2 shows the changes in the relative risk rating after treatment. Extreme and high risk areas are reduced by 152,984 acres.

Pumpkin fire four years later. Source: G. Kleindienst

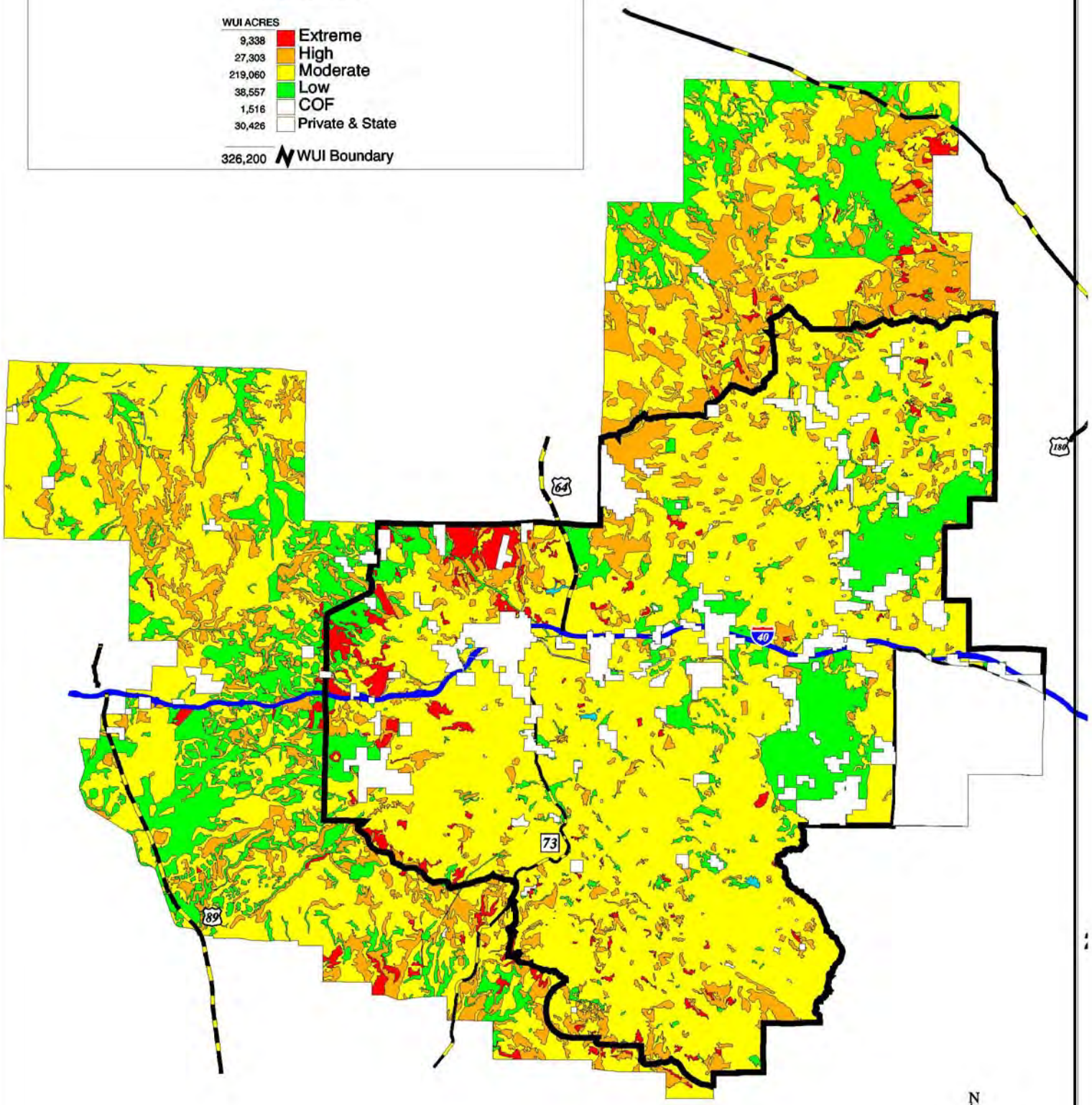
Pumpkin fire erosion, July 2000. Source: Kaibab National Forest

CROWN FIRE RISK AFTER SIMULATED 40 BA THINNING & BURNING

Map 10

Kaibab National Forest
Williams Ranger District
Coconino County

WUI ACRES	
9,338	Extreme
27,303	High
219,060	Moderate
38,557	Low
1,516	COF
30,426	Private & State
326,200	WUI Boundary



N
W
E
S

6 0 6 Miles

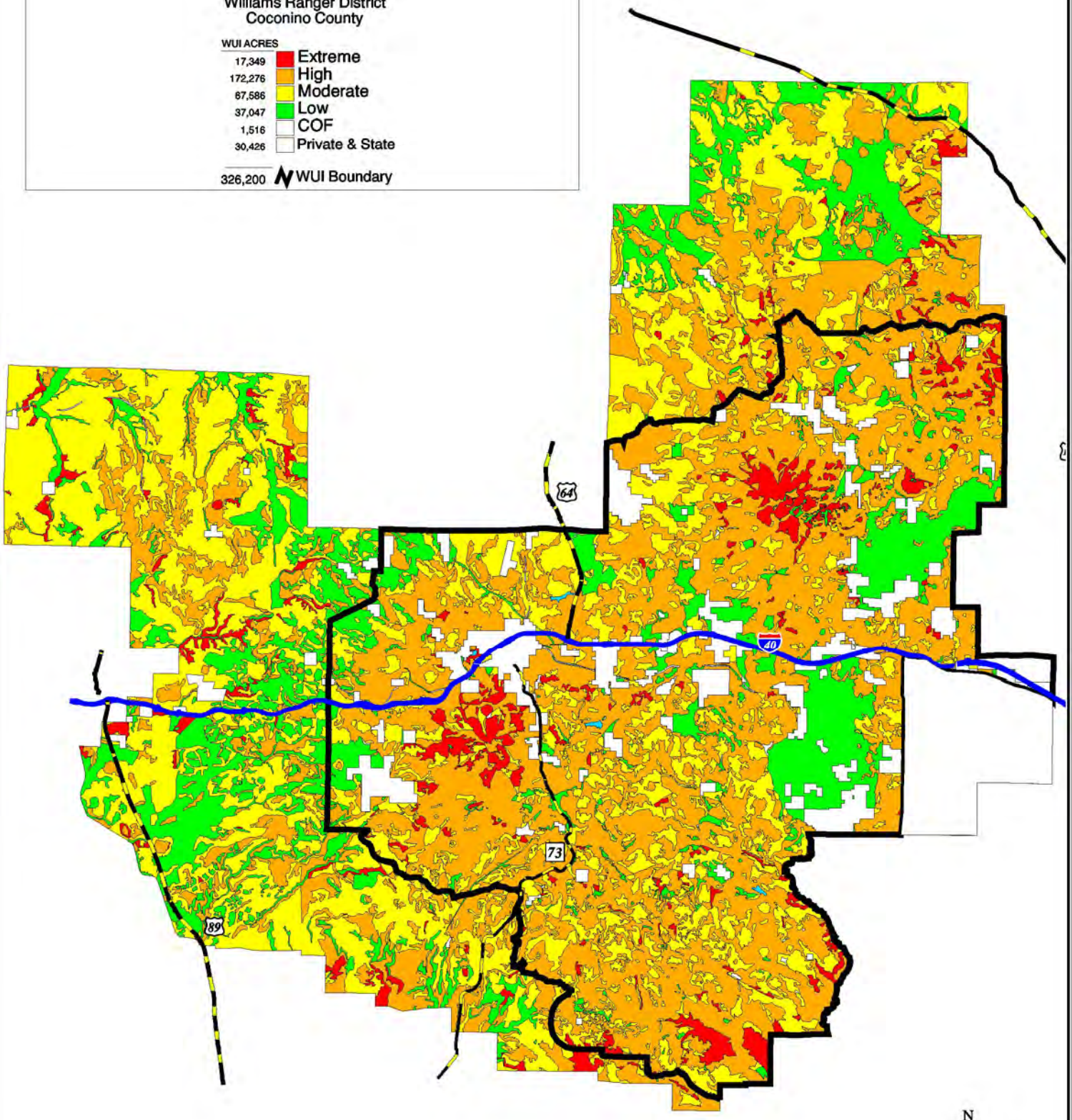
TGMc January 2005
/trifles/wui/williams/utm/5150_fuel_mgt/crwpp_gbleindicest Crown Fire Risk after Thinning to 40 BA

CROWN FIRE RISK ASSESSMENT & WUI BOUNDARY

Map 11

Kaibab National Forest
Williams Ranger District
Coconino County

WUI ACRES	
17,349	Extreme
172,276	High
67,586	Moderate
37,047	Low
1,516	COF
30,426	Private & State
326,200	WUI Boundary



N
W
E
S

TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst Crown Fire Risk

C. Priority Treatment Area Identification

The priority treatment area map was developed using the dominant vegetation and the crown fire risk assessment in combination with developed private and federal lands. Emphasis was placed on the areas south and west of developments and Bill Williams Mountain to provide a 4-6 mile buffer for treatment. The high priority areas are around the City of Williams, highly developed lands south of I-40 to Parks, and from Parks north to cover this area of multiple homes and subdivisions. The medium priority areas are in the ponderosa pine and Douglas fir vegetation zones and add an additional buffer zone adjacent to the high priority areas. The low priority areas are generally the grasslands and the pinyon juniper areas within the WUI.

The majority of the fuels treatment work, by any agency, should be in the high priority areas; however some work should also be done in areas of medium and low priority depending upon funding and site specific planning. Extensive coordination is ongoing between the Kaibab National Forest and the Rural Communities Fuels Management Partnership to set priorities for fuels treatments along the boundaries of private and federal lands. This collaborative effort will further refine the priority treatment areas to gain priority funding to enhance and extend protection for all development within the WUI.

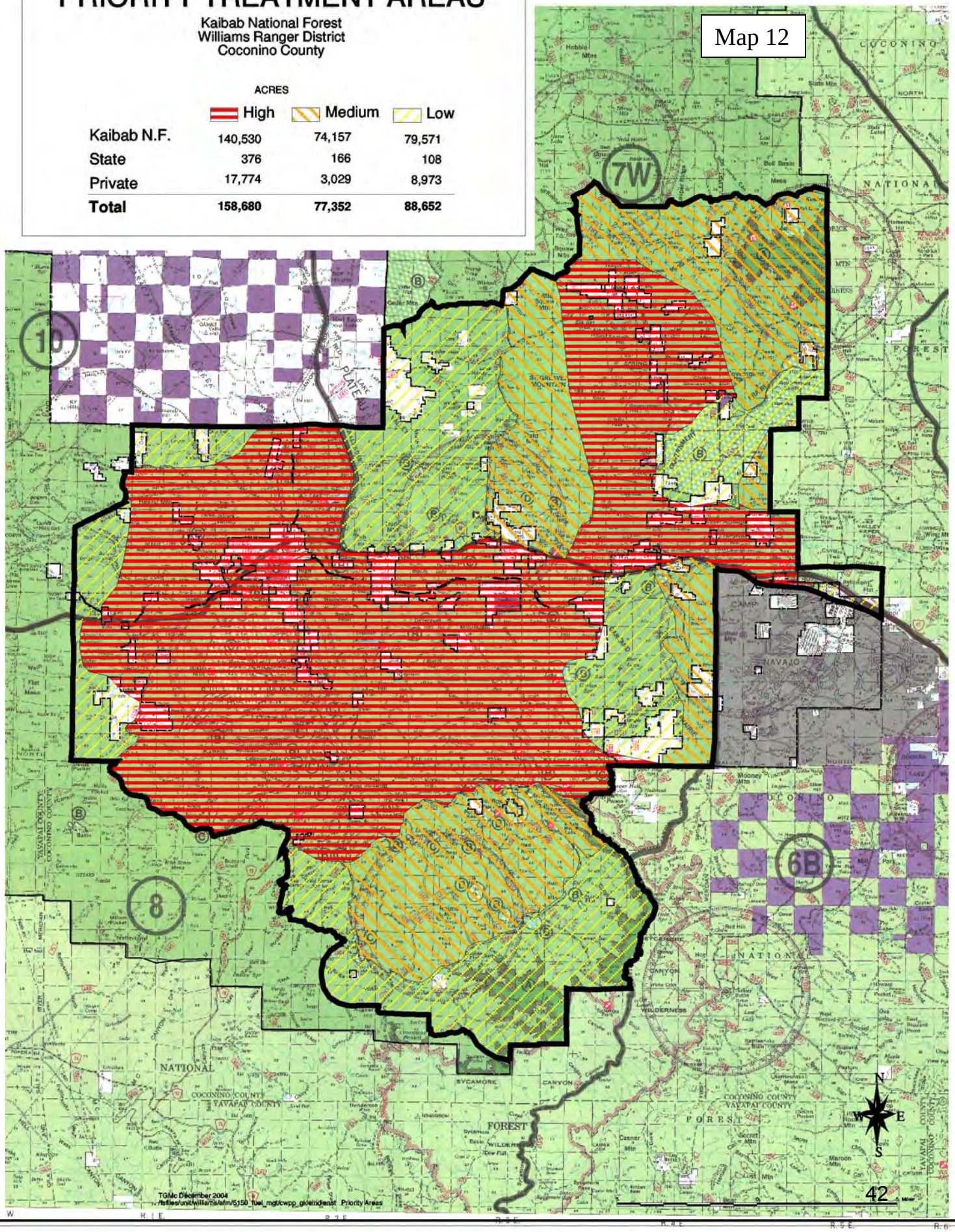
In the medium and high priority treatment areas, various combinations of treatments will likely be required and are highly recommended. The low priority treatment areas may only need broadcast burning to prevent crown fire initiation. While the CWPP identifies priority areas for fuels treatment, site specific planning must be accomplished by each jurisdictional agency to determine the appropriate level and means of treatments required. Again, the goal of the CWPP is to identify priority areas for fuel treatments that reduce the likelihood of catastrophic crown fires.

PRIORITY TREATMENT AREAS

Kaibab National Forest
Williams Ranger District
Coconino County

Map 12

	ACRES		
	High	Medium	Low
Kaibab N.F.	140,530	74,157	79,571
State	376	166	108
Private	17,774	3,029	8,973
Total	**158,680**	**77,352**	**88,652**



D. Fuels Treatment Cost Estimates

Within the greater Williams area WUI of 326,200 acres, it is estimated that approximately 250,000 acres will require some level of fuels treatment at a cost of over $200 million. The costs are estimated using information from the Kaibab National Forest and other Northern Arizona CWPP plans. The costs are estimated averages and recognize that cutting hazard trees around homes, power lines, etc., is a very high risk undertaking and could cost $2,000-$3,000/acre or more for professional tree removal.

A cost estimate of $30/acre is included for planning and monitoring. This is a Forest Service estimate for planning large area treatments, generally over 10,000 acres. It is recognized that planning, monitoring, and administration of work on private land and very small parcels of land is much more costly than this Forest Service estimate.

Not every acre within the WUI will require treatment. For purposes of the CWPP, it is estimated that 90% of high priority acres need treatment, 80% of medium priority, and only 50% of the low priority acres will require some level of fuels treatment.

High priority areas call for heavy thinning, piling, pile burning, and broadcast burning. Medium priority areas call for intermediate thinning, piling, pile burning, and broadcast burning. Low priority areas call light thinning and broadcast burning. Appendix 3 details the cost breakdown and estimates for implementing this plan.

A goal of the agencies involved in the CWPP is to treat all 250,000 acres over the next 10 years. This will require an annual budget of $20,000,000 with most funding going to the Forest Service. Approximately $1.9 million would be needed annually to treat private lands and approximately $50,000 annually to treat state lands. This level of funding would result in an average of 25,000 acres of fuels treatment each year.

Again, implementation of treatments recommended in the CWPP, requires site-specific project planning by the jurisdictional agency. The CWPP offers a broad outline of treatment options available for use along with prioritized areas for fuels treatment that will produce the greatest benefit in protecting our communities.

E. Funding Sources

The purpose of the collaborative development of the greater Williams area CWPP is to demonstrate the risks associated to our communities spread throughout a fire prone environment. Implementation of the recommended actions and fuels treatment, beginning in the high priority areas, requires commitment and funding for all agencies and landowners involved. This plan, and implementation of the identified treatments, is intended to demonstrate our commitment and provides elected and governmental officials needed information to support this plan through adequate funding and assistance through grant monies.

As the biggest land steward in the WUI, approval of the greater Williams area CWPP will allow the Kaibab National Forest to compete with other forests for the anticipated increase in WUI funding through the Healthy Forests Restoration Act of 2003. On the state side, fire districts, the City of Williams, and Coconino County should individually or in partnership be competitive for grants from either the state or federal government. State fire assistance grants and Forest Land Enhancement Program funds are the most likely source of funding for fuels treatment on private lands, but agencies are encouraged to apply for Forest Service rural development grants and economic action programs.

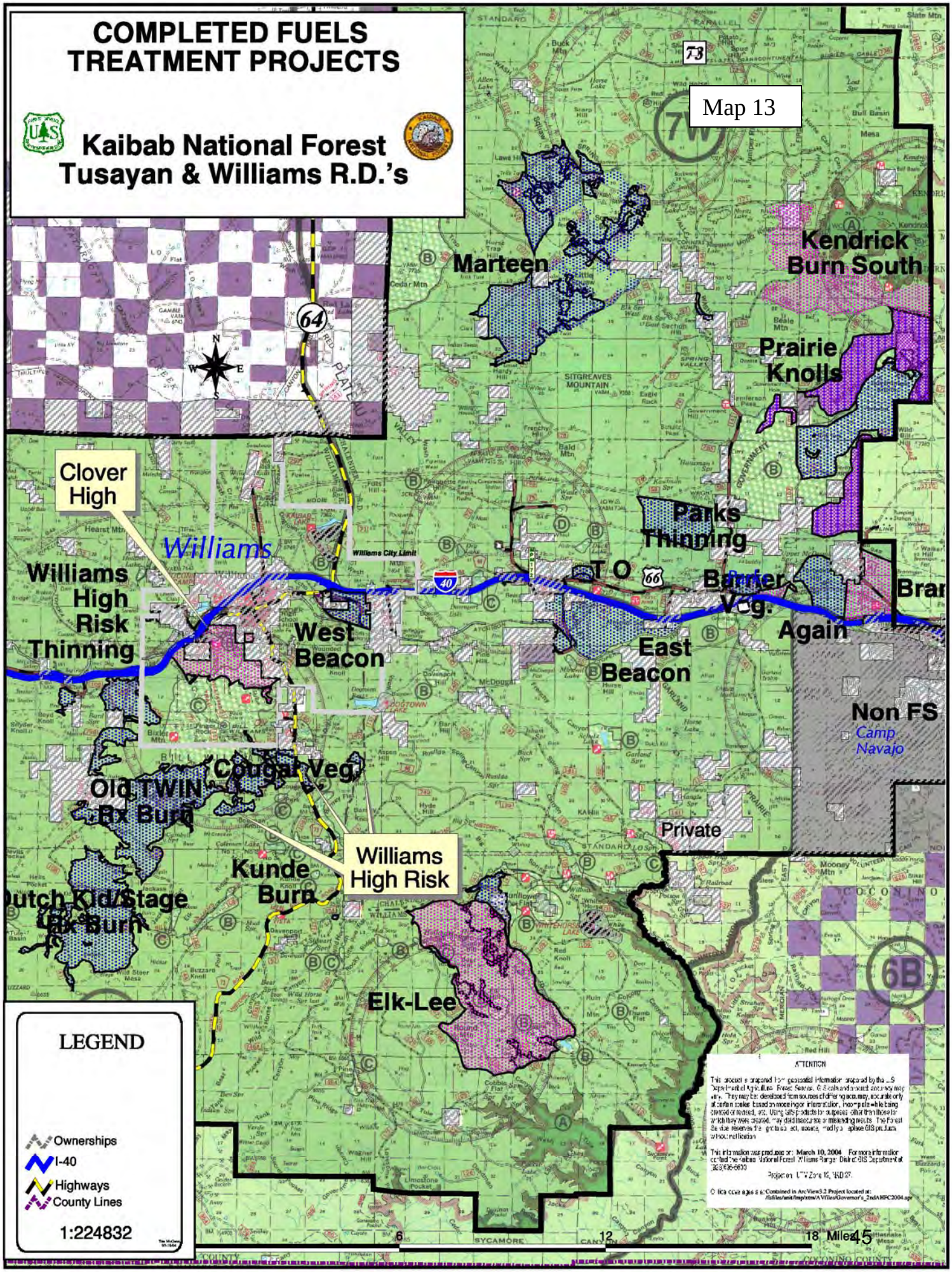
Coconino County has made some Title lll funds available for the Coconino County Rural Environmental Corps (CREC) to do thinning work on private land. Title lll legislation specifically authorizes these funds to be allowed as matching funds for federal grants, so they offer the opportunity for securing additional grant funds. CREC has already participated in grant preparation with the local partnership in the Parks/Williams area for 2005 grants using these funds as part of the match. (See Section G of the CWPP for more information on the Rural Communities Fuels Management Partnership).

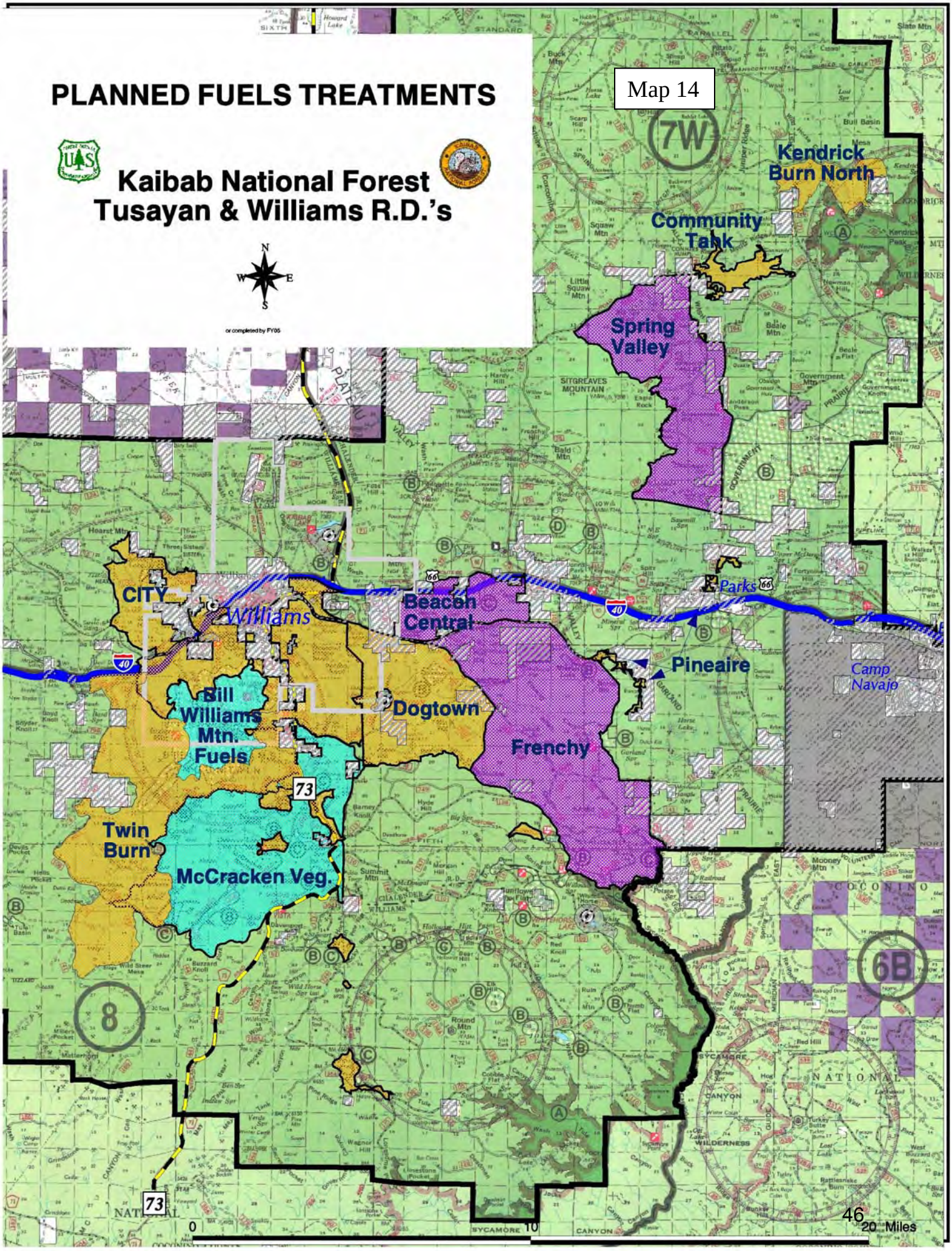
The greater Williams area agencies will individually and through the Rural Communities Fuels Management Partnership continue to support the development of business opportunities for wood and biomass utilization. Solid wood applications in which businesses are actively exploring or have already invested in Northern Arizona include; round wood construction, composite products like oriented strand board (OSB) and wood/plastic materials, and engineered lumber like glue-laminate beams and finger-jointed lumber. Biomass applications include wood chips for energy production, fuel pellets for heating, and biochemical extractives. Other products for which small diameter pine is currently being used in the region include firewood, posts and poles, landscaping timbers, ground covers and mulch, pallet manufacturing, and crafts.

The City of Williams, Coconino County, Arizona State Land Department, and the Kaibab National Forest will continue to explore opportunities for developing economic uses for wood products. The largest volume of wood needing removal is in the 9-16 inch size category. If businesses were formed that could pay for, remove and utilize all of this material, the forests would be greatly enhanced and commercial profits would easily pay for all the remaining fuel treatments of thinning and burning required in the wildland urban interface. Any commercial value that can be obtained from the huge volume of wood needing removal from our forested lands will assist in funding needed fuels treatments.

F. Forest Service Completed and Planned Projects

The following two maps (Maps 13 and 14) display fuels treatment projects the Williams Ranger District has completed over the past several years and their planned future treatment areas. The majority of the completed and planned treatment areas are within the high priority area identified in this plan. Nearly two decades ago, the district began prioritizing projects around developed private lands and has worked steadily to complete fuels treatments in the wildland urban interface.


COMPLETED FUELS TREATMENT PROJECTS
Kaibab National Forest
Tusayan & Williams R.D.'s
Map 13
Marteen
Kendrick Burn South
Prairie Knolls
Clover High
Williams
Williams High Risk Thinning
West Beacon
Parks Thinning
T O
Barrier Veg. Again
East Beacon
Non FS
Camp Navajo
Cougar Veg
Old TWIN Rx Burn
Kunde Burn
Williams High Risk
Private
Dutch Kid/Stage Rx Burn
Elk-Lee
LEGEND
Ownerships
I-40
Highways
County Lines
1:224832
6
12
18 Miles
ATTENTION


PLANNED FUELS TREATMENTS
Kaibab National Forest
Tusayan & Williams R.D.'s
Map 14
Kendrick Burn North
Community Tank
Spring Valley
CITY
Williams
Beacon Central
Parks
Pineaire
Camp Navajo
Bill Williams Mtn. Fuels
Dogtown
Frenchy
Twin Burn
McCracken Veg.
73
7W
6B
8
0
10
20 Miles

G. Coconino County and Arizona State Land Department Projects

Within the greater Williams area, several agencies, departments, and universities work together to provide fuels treatment on private lands. These entities formed a partnership in 2001 that works under the umbrella of the Rural Communities Fuels Management Program (RCFMP). Participants in the RCFMP partnership include the Arizona State Land Department (ASLD), the Coconino County Rural Environmental Corps (CREC), the Kaibab National Forest, Coconino County Public Works and Environmental Conservation Corps, the City of Williams, Sherwood Forest Estates and Parks-Bellemont Fire Departments, the Arizona State Department of Corrections, Northern Arizona University Ecological Restoration Institute, and the University of Arizona.

The Rural Communities Fuels Management Partnership was established to not only facilitate fire risk reduction and improve forest health on private land through thinning, but also to complement similar work being planned or implemented on adjacent National Forest land.

The partners all play an important role in the success of the partnership, but on-the-ground project implementation has been primarily managed by ASLD. Securing and managing grants to fund the thinning efforts has been the role of the University of Arizona.

ASLD has authority to assist private property owners with forest health work on private property, currently called the Forest Land Enhancement Program (FLEP). The table on the following page displays what ASLD has accomplished in the CWPP area to date under the FLEP program. This program is expected to be maintained or even increased. With the development of the informal partnership (RCFMP), work accomplished on private land in the CWPP has greatly expanded.

Thinning work in the CWPP area has been completed by CREC, the Arizona Department of Corrections, and contract thinning crews. Since the partnership's inception, more than 250 acres have been treated with thinning. More properties are currently signed up for treatment than available funding can support.

The table on the following page shows the work accomplishment under the RCFMP umbrella from 2001 through 2004. Both SFA grant funds and Title lll funds are available for more work in 2005.

Table 1. ASLD, CREC, and RCFMP Projects

Location/Subdivision	Acres Thinned Grant Funds	Acres Thinned ASLD FLEP	Acres Thinned CREC-Title III	Acres Signed-up But not thinned
Parks North	40			125
Sherwood Forest Parks	39			10
Ski Village	15			22
Peaceful Valley				85
Parks-Pines				4
Spring Valley	17			6
Pumpkin Center	27			
Spitz Springs Road				30
Parks South	10			
Sherwood Forest Estates	73			58
Williams North	10	52	5	3
Whispering Pines	2			
Williams South	5	12		28
Pine Meadows Estates	27			4
The Woods	3			7
Mountain Shadows				10
Total	**268**	**64**	**5**	**392**

Up to this time the RCFMP has limited their thinning work to private properties with ponderosa pine over story. Most of the partnership work to date occurred within the priority 1 area shown on Map 12. The total number of acres of private property within the priority 1 area is 17,774, of which approximately 337 acres are treated. To be most effective, the partnership should consider focusing future work on priority 1 lands identified in this plan.

VIII. Structure Ignitability

Mitigation actions designed to reduce dangerous fuel accumulations within the greater Williams area are based, in part, on the "Guiding Principles for Forest Ecosystem Restoration and Community Protection" promulgated by Governor Janet Napolitano's Arizona Forest Health Advisory Council in March 2004. Two of these principles are:

- *In fire prone areas, community officials must develop, adopt, and enforce comprehensive land use plans, zoning regulations, and building codes for community protection, forest restoration, ecosystem health requirements, and long term fire management. Zoning and land use have a major impact on fire management, and can make a significant contribution to restoring forest health and protecting communities.*
- *Forest ecosystem restoration requires effective community protection to establish and maintain a fire-resistive condition for structures, improvements, and vegetation.*

Methods of accomplishing this condition are based on public safety needs, fire hazard, and local capability and creativity. A fire-resistive condition will be accomplished by removing and modifying forest fuels, establishing defensible space, and use of fire-resistant construction materials and architectural design.

Private property owners are encouraged through this CWPP to become educated on ways to protect their homes through firewise practices. The Firewise Communities organization is a national program that promotes the education of the public in ways to mitigate losses and provide an area around their homes (defensible space) where firefighters can safely work. This defensible space around structures provides at least 30 feet of cleared or fire resistant plant material as well as room for firefighting equipment. Treatment of the area further than 30 feet is very site dependent and can range out to several hundred feet of needed treatment. Firewise also advises people on fire resistant building materials, especially roofing. People are encouraged to visit www.firewise.org for additional details on methods to protect themselves and their homes. Appendix 4 contains a few firewise tips for residents in the greater Williams area.

The Rural Communities Fuels Management Partnership is also a source of information on ways to protect properties from wildfire. The partnership promotes the FIREWISE concept by participating with booths at local events in Parks, Sherwood Forest Estates and Williams, offering information about defensible space and structure ignitability, as well as the thinning program. They also present programs to homeowners' associations and other groups. RCFMP emphasizes that people need to take action on their property regardless of whether or not they are candidates for the partnership thinning program or other available programs. RCFMP members will conduct assessments of properties so that the owners can proceed on their own. The partnership also provides a place for local residents to dispose of material removed from their property while implementing FIREWISE techniques.

Well thinned and limbed property in the WUI. Source: G. Kleindienst

Even though the CWPP covers primarily the ponderosa pine and Douglas fir zones surrounding Williams, the outlying communities, predominantly in the pinyon juniper and grasslands, are also encouraged to follow firewise recommendations. The recent drought has resulted in heavy mortality, especially in the pinyon pine, and destructive wildfires are possible. All homeowners living in a fire prone environment should consider implementing the firewise defensible space guidelines around their homes and on their property.

WUI hillside with abundance of dead standing PJ. Source: G. Kleindienst

The goal of the CWPP regarding reduction of structure ignitability is to provide various options for consideration by the City and the Fire Districts.

Adoption of the 2003 Uniform Fire Code (UFC) Chapter 17 Wildland Urban Interface or the International Code Council (ICC) Urban-Wildland Interface Code is an option but problematic and costly. Adoption of either the UFC or ICC codes requires simultaneous adoption of companion codes such as the Uniform Building Code. The UFC only applies to commercial and multi-family buildings and does not apply to single-family homes. With adoption of a code series, municipalities and/or fire districts are required to enforce the entire code.

Alternately, adoption of an existing WUI code alone is possible, but current versions of the WUI codes are highly restrictive and generally based upon Southern California fire code standards.

A third option is administrative interpretation of the UFC. An example is the neighboring City of Flagstaff, which currently requires all new developments to submit a fuels management plan or forest stewardship plan through their development and review process. Voluntary compliance is encouraged for new construction of single-family homes. Their authority comes from their interpretation of the 1997 Uniform Fire Code chapter on hazardous vegetation and effectively

deals with defensible space. The City of Flagstaff did not pass a resolution or ordinance and UFC interpretation was accomplished administratively by their fire department and development and review departments.

In October 2004, the Arizona State Senate appointed a State Urban-Wildland Fire Safety Committee. The purpose of the committee is to develop recommended minimum standards in seven areas that will eventually lead to legislation. These State standards and guidelines or Arizona fire code for wildland urban interface protection will then be available for adoption by local counties, municipalities, and fire districts. The seven areas the committee is tasked to review and make recommendations on are:

- Safeguarding life and property from wildfire and fire hazards.
- Preventing wildfires and alleviation of fire hazards.
- Storage, sale, distribution and use of dangerous chemicals, combustibles, flammable liquids, explosives, and radioactive materials in urban wildland interface areas.
- Fire evacuation routes and community alert systems.
- The creation of defensible spaces in and around the urban wildland interface as authorized by existing county and municipal laws and ordinances.
- The application of adaptive management practices in monitoring data from treatment programs to assess the effectiveness of those programs in meeting forest health objectives
- Other matters relating to urban wildfire prevention and control that the Committee considers to be necessary.

If and when these committee recommendations become law, it is likely to be less restrictive than current existing WUI codes and will likely favor private property rights. Current understanding from a committee member is that adoption of an Arizona fire code by the state would be optional for local entities and not required. At that time, agencies can review the state guidelines and choose to adopt them or not. Waiting for this Arizona fire code is a fourth option.

Educating property owners and developers on the benefits of firewise practices and encouraging voluntary compliance has also been highly successful in many areas of the country.

Five options for reducing structure ignitability in the greater Williams area are presented. The City of Williams and the Fire Districts should focus on four items in choosing which option to use in managing the wildland urban interface. These four items are; (1) fire-resistant construction materials, (2) adequate access for fire equipment, (3) adequate water supply, and (4) vegetation management and defensible space. Again, the five options offered for city and fire district consideration are:

- Adopt the 2003 Uniform Fire code and companion codes.
- Adopt a Wildland Urban Interface code.
- Administratively interpret existing UFC codes and develop WUI guidelines.
- Wait for legislation on an Arizona State fire code.
- Encourage voluntary compliance with firewise practices.

As stated in the Guiding Principles, building codes, zoning regulations, defensible space, architectural design, and building materials all contribute to protecting our communities. The City of Williams, Coconino County, and the fire districts are encouraged to research and implement ways to reduce structural ignitability and create defensible space.

IX. Community Education

Interested members of the public are encouraged to read this CWPP and become involved with agencies in their site-specific project planning efforts. Greater Williams area agencies will continue their public education programs through various means, such as; news releases, public meetings, project scoping, agency web sites, information booths (rodeo, fair, parades, etc.), school programs, homeowner association meetings, WFAC meetings, City Council meetings, and Board of Supervisor meetings. During any of these public contacts, discussion of the benefits of forest restoration and firewise techniques is encouraged. Use of the relative risk rating maps contained in the CWPP may be a good method of opening discussions about community wildfire protection, forest restoration, and needed fuels treatment.

X. Monitoring

Monitoring in conjunction with adaptive management is essential to ensure that CWPP goals are met. Multi-party monitoring will determine if implemented projects resulted in a significant and measurable reduction of risk to the communities and landscapes within the WUI. The Healthy Forests Restoration Act of 2003 requires the Forest Service (in areas where significant interest is expressed) to establish a multi-party monitoring, evaluation, and accountability process in order to assess the positive or negative ecological and social effects of authorized hazardous fuel reduction projects. Each agency in the greater Williams area currently reports accomplishments annually. The Rural Communities Fuels Management Partnership also reports accomplishment on state and private lands annually. A system will be developed by the member agencies through the RCFMP to collect all annual accomplishments and report to the Williams City Council, Coconino County Board of Supervisors, and the general public on a yearly basis. The RCFMP meets bimonthly to share progress, identify problems and opportunities, and plan work in a collaborative manner so that the work of each organization complements the work of the others to the extent possible.

XI. Summary

The greater Williams area Community Wildfire Protection Plan is a collaborative effort by all agencies and concerned citizens in the region. The CWPP meets the goals of creating a community base map, defining the wildland urban interface, and analyzing the risks of fuel hazards, fire occurrence, development and other values at risk. The CWPP offers a wide range of fuels treatment options for use on federal, state, and private lands. Concerned citizens, elected and governmental officials that read the CWPP will be better informed on fuel hazards, fuel treatments, and the use of firewise techniques in protecting homes. The CWPP offers options for the City and the Fire Districts to implement firewise development and encourage homeowners to create defensible space on their properties. The CWPP core team agencies along with the

Wildland Fire Advisory Council are committed to strengthening their fire prevention efforts and continuing their mutual assistance during fire suppression emergencies.

Funding and implementation of the CWPP will allow jurisdictional agencies to complete site specific project planning and complete the necessary fuels treatments to reduce the likelihood of a crown fire threatening lives, homes, and our irreplaceable natural resources and ecosystems.

XII. References and Literature Citations

Graham, Russell T. 2004. Science Basis for Changing Forest Structure to Modify Wildfire Behavior and Severity (General Technical Report RMRS-GTR-120). USDA Forest Service, Rocky Mountain Research Station.

Guiding Principles for Forest Ecosystem Restoration and Community Protection, 2003. Prepared by the Arizona Forest Health Advisory Council.

Healthy Forests Restoration Act of 2003. United States Congress. Signed into law by President George W. Bush December, 2003.

Preparing a Community Wildfire Protection Plan, 2004. A Handbook for Wildland Urban Interface Communities. Sponsored by: Communities Committee, National Association of Counties, National Association of State Foresters, Society of American Foresters, and Western Governors' Association.

XIII. Appendices

1. Wildland Fire Advisory Council fire equipment listing.
2. Specific map information tables.
3. Fuels treatment cost estimates.
4. Firewise techniques and tips.

Appendix 1

WILDLAND FIRE ADVISORY COUNCIL
EQUIPMENT LISTING
STRUCTURE EQUIPMENT

Ash Fork Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Engine	Engine 1	6	500	750	Yes
Engine	Engine 2	5	1000	750	Yes

Junipine Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Water Tender	Truck 1	3	1000	50	No
Engine	Truck 2	2	400	750	No
Water Trailer	Trailer 1	3	1000	50	No

Sherwood Forest Estates Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Engine	Engine 1	5	600	700	Yes
Pumper	Engine 2	3	1000	125	Yes
Engine	Engine 3	1	500	1000	Yes
Water Tender	Tender 4	3	1500	400	Yes
Water Tender	Tender 5	3	1500	200	Yes

Kaibab Estates West Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Engine	Engine 1	6	500	750	Yes

Parks-Bellemont Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Engine	Engine 1	1	1000	1250 (CAFS)	Yes
Engine	Engine 2	1	3500	1500	Yes

Valle-Wood Volunteer Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Engine	Engine 1		400	1000	Yes
Engine	Engine 2	3	300	250	

WILDLAND FIRE ADVISORY COUNCIL
EQUIPMENT LISTING
STRUCTURE EQUIPMENT
(continued)

Williams Volunteer Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Engine	Engine 3		300	1000	Yes
Engine	Engine 5		500	1500	Yes
Engine	Engine 6		500	1500	Yes
Engine	Engine 8		1000	1250	Yes

Paulden Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Engine	Engine 1		500	1500	
Water Tender	Tender 1		1200	N/A	

WILDLAND FIRE ADVISORY COUNCIL
EQUIPMENT LISTING
WILDFIRE EQUIPMENT

Kaibab National Forest

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Engine	Engine 12	3	600	350	Yes
Engine	Engine 14	3	600	350	Yes
Engine	Engine 11	6	200	50	Yes
Engine	Engine 13	6	200	50	Yes
Engine	Engine 41	6	200	50	Yes
Engine	Engine 42	6	200	50	Yes
Dozer	Doz. 11	3	N/A	N/A	Yes
Dozer	Doz. 12	3	N/A	N/A	Yes
Prevention	Patrol 11	7	125	35	Yes
Prevention	Patrol 12	7	125	35	Yes
Prevention	Patrol 41	7	125	35	Yes
Prevention	Patrol 42	7	125	35	Yes
Helicopter	Hel. 336	3	80 Bucket	N/A	Yes

WILDLAND FIRE ADVISORY COUNCIL
EQUIPMENT LISTING
WILDFIRE EQUIPMENT
(continued)

Ash Fork Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Engine	Engine 3	6	250	500	Yes

Valle-Wood Volunteer Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Brush Truck	Brush Truck 1	6	200	60	No
Brush Truck		3	300	250	Yes

Williams Volunteer Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Engine	Engine 2		1000	750	Yes
Engine	Truck 4	6	300	500	Yes
Water Tender	Tanker 1	3	2,000	250	Yes

Parks-Bellemont Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Brush Truck	Brush 1	6	210	50	Yes
Brush Truck	Brush 2	6	300	50	Yes
Brush Truck	Brush 3	2	500	500	Yes
Brush Truck	Brush 4	2	750	750	Yes
Water Tender		2	1500	100	Yes
Water Tender		2	4000	750	Yes

Sherwood Forest Estates Fire Department

Resource	Call Sign	ICS Type	H20 Capacity	GPM	Mutual Aid Ch.
Engine	Engine 1	5	600	700	Yes
Pumper	Engine 2	3	1000	125	Yes
Engine	Engine 3	1	500	1000	Yes
Water Tender	Tender 4	3	1500	400	Yes
Water Tender	Tender 5	3	1500	200	Yes

Appendix 2

TABLES OF MAP INFORMATION

The following tables describe the acreages and associated information pertinent to maps used in the CWPP.

COMMUNITY BASE MAP

Land Owner	Acres	% of Total
Kaibab National Forest	294,258	90.2%
Private land	29,776	9.1%
Coconino National Forest	1,516	.5%
State land	650	.2%
Total	326,200	

DOMINANT OVERSTORY VEGETATION MAP

Vegetation	Acres	% of Total
Mixed Conifer	13,631	4.2%
Ponderosa Pine	221,550	67.9%
Ponderosa Pine grasslands	72,304	22.2%
Pinyon juniper	16,998	5.2%
Pinyon juniper grasslands	1,381	.4%
Water	336	.1%
Total	326,200	

CROWN FIRE RISK MAP

Adjective Rating	Acres	% of Total
Extreme	17,349	5.3%
High	172,276	52.8%
Moderate	67,586	20.7%
Low	37,047	11.4%
Private	29,776	9.1%
Coconino National Forest	1,516	.5%
State land	650	.2%
Total	326,200	

WILLIAMS RANGER DISTICT 20-YEAR FIRE OCCURRENCE (1983-2002)

	Total Fires	Total Acres	Yearly Average Fires	Yearly Average Acres
Lightning cause	1,422	15,255	71	763
Human cause	488	2,786	24	139
Total	1,910	18,041	95	902

DEVELOPMENT RISK MAP

Land Ownership	Acres	% of Total
Kaibab National Forest undeveloped land	292,946	89.8%
Kaibab National Forest developed land	1,312	.4%
Developed private land	27,153	8.3%
Undeveloped private land	2,623	.8%
Coconino National Forest	1,516	.5%
State land	650	.2%
Total	326,200	

CUMMULATIVE RISK MAP*

Adjective Rating	Acres	% of Total
Extreme	44,502	13.6%
High	172,276	52.8%
Moderate	70,209	21.5%
Low	37,047	11.4%
Coconino National Forest	1,516	.5%
State land	650	.2%
Total	326,200	

*Private land acres included in this map have not been analyzed to determine crown fire risk.

PRIORITY TREATMENT AREA MAP

	High Priority	Medium Priority	Low Priority
Kaibab National Forest	140,530	74,157	79,571
State Land	376	166	108
Private Land	17,774	3,029	8,973
Total	158,680	77,352	88,652

CROWN FIRE RISK ASSESSMENT AFTER SIMULATED THINNING TO 40 BA, PILE, AND BURN

Adjective Rating	Acres	% of Total
Extreme	9,338	2.9%
High	27,303	8.4%
Moderate	219,060	67.1%
Low	38,557	11.8%
Private	29,776	9.1%
Coconino National Forest	1,516	.5%
State land	650	.2%
Total	326,200	

COMPARISON TABLE OF CROWN FIRE RISK BETWEEN SIMULATED TREATMENT & CURRENT CONDITIONS

Adjective Rating	Current Acres	Simulated Treatment Acres	Acreage Difference
Extreme	17,349	9,338	-8,011
High	172,276	27,303	-144,973
Moderate	67,586	219,060	+151,474
Low	37,047	38,557	+1,510
Private	29,776	29,776	0
Coconino National Forest	1,516	1,516	0
State Land	650	650	0
Total	326,200		

Appendix 3

FUELS TREATMENT COST ESTIMATION CALCULATIONS

High Priority Area		**KNF Acres**	**PVT Acres**	**State Acres**	**Total Acres**
90% of Acres Treated	Total Acres	140,530	17,774	376	158,680
	90% of Acres	126,477	15,997	338	142,812
	Treatment Costs				
Heavy Thin 0-16"	$450				
Piling	$250				
Pile Burning	$50				
Broadcast Burning	$150				
Plan & Monitor	$30				
Total	$930				
Cost for 90% of area		$117,623,610	$14,876,838	$314,712	$132,815,160
Medium Priority Area		**KNF Acres**	**PVT Acres**	**State Acres**	**Total Acres**
80% of Acres Treated	Total Acres	74,157	3,029	166	77,352
	80% of Acres	59,326	2,423	133	61,882
	Treatment Costs				
Intermediate Thin 0-16"	$350				
Piling	$215				
Pile Burning	$50				
Broadcast Burning	$150				
Plan & Monitor	$30				
Total	$795				
Cost for 80% of area		$47,163,852	$1,926,444	$105,576	$49,195,872
Low Priority Area		**KNF Acres**	**PVT Acres**	**State Acres**	**Total Acres**
50% of Acres Treated	Total Acres	79,571	8,973	108	88,652
	50% of Acres	39,786	4,487	54	44,326
	Treatment Costs				
Light Thin 0-16"	$250				
Broadcast Burning	$150				
Plan & Monitor	$30				
Total	$430				
Cost for 50% of area		$17,107,765	$1,929,195	$23,220	$19,060,180
Total Cost by Agency		**$181,895,227**	**$18,732,477**	**$443,508**	**$201,071,212**
Treated Acres		**225,588**	**22,906**	**525**	**249,020**
Piling Cost Figures	Hand Pile	Dozer Pile	Average Used		
Heavy Thin 0-16"	$300	$200	$250		
Intermediate Thin 0-16"	$250	$180	$215		

ASSUMPTION IN COST ESTIMATES: Required thinning of trees larger than 16" DBH will likely be accomplished through commercial means. Planning and monitoring cost estimates are for large scale Forest Service projects. These costs generally are much higher per acre for small scale work on state and private lands.

Appendix 4

GREATER WILLIAMS AREA CWPP FIREWISE TIPS

1. Stack firewood away from the house.
2. Thin and prune trees and shrubs.
3. Maintain a circle of safety—at least 30 feet or greater on slopes.
4. Keep grass and weeds mowed.
5. Keep the immediate area clear of debris.
6. Enclose openings such as porches and foundations.
7. Remove tree limbs that hang over structures.
8. Replace or treat wood shake roofs with fire retardant materials.
9. Keep roofs and gutters clear of debris.
10. Keep your fire extinguisher charged and available, and a hose near outdoor faucets.
11. Dispose of ashes properly.
12. Provide adequate access for emergency vehicles.
13. Install spark arrestors on chimneys.
14. Provide an adequate outdoor water supply.
15. Dispose of trash legally—do not burn it.

Firewise Construction:

- Use construction materials that are fire-resistant or non-combustible whenever possible.
- Use shingles such as Class-A asphalt, slate or clay tile, metal, or cement and concrete products for roof construction.
- Construct a fire-resistant sub-roof for added protection.
- Use fire-resistant materials such as stucco or masonry for exterior walls. These products are much better than vinyl which can soften and melt.
- Consider both size and materials for windows; smaller panes hold up better in their frames than larger ones; double pane glass and tempered glass are more effective than single pane glass; plastic skylights can melt.
- Prevent sparks from entering your home through vents, by covering exterior attic and foundation vents with wire mesh no larger than 1/8 of an inch.
- Keep your gutters, eaves, and roof clear of leaves and other debris.
- Clear dead wood and dense vegetation within at least 30 feet from your house, and move firewood away from your house or attachments like fences or decks.
- If you wish to attach an all-wood fence to your home, use masonry or metal as a protective barrier between the fence and house.
- Use non-flammable metal when constructing a trellis and cover with high moisture, fire-resistant vegetation.
- Prevent combustible materials and debris from accumulating beneath patio deck or elevated porches; screen underneath or box in areas below the deck or porch with wire mesh no larger than 1/8 of an inch.

Firewise Landscaping:

- Within the defensible space, a well irrigated area that encircles your home for at least 30 feet on all sides, plants should be limited to carefully spaced fire resistant tree and shrub species. Keep lawns and dry weeds mowed. Limb trees up at least 10 feet.
- From the 30 foot defensible space out to 100 feet, use plants that are low growing, well irrigated, and with ample openings. Remember plant spacing to keep ladder fuels from being placed near taller vegetation and trees.
- Past 100 feet can be a natural area. Thin selectively and remove highly flammable vegetation.
- Follow the Lean, Clean, and Green guidelines.

  Lean – Prune shrubs and cut back tree branches, especially within 15 feet of your chimney.

  Clean – Remove all dead plant material from around your home; this includes dead leaves, dry vegetation, and even stacked firewood.

  Green – Plant fire-resistant vegetation that is healthy and green throughout the fire season.

Firewise Home Inspection Contacts:

- Arizona State Land Department 928-774-1425
- Williams Ranger District – Forest Service 928-635-5600
- City of Williams Fire Department 928-635-4451
- Parks-Bellemont Fire Department 928-635-5311
- Sherwood Forest Estates Fire Department 928-635-9837

For additional information and firewise tips, visit www.firewise.org.